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THE

EDINBURGH MEDICAL AND SURGICAL JOURNAL:

EXHIBITING

A CONCISE VIEW

OF THE

LATEST AND MOST IMPORTANT DISCOVERIES

IN

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Communications have been received from Dr Blair, Dr Stratton, Dr Keith Imray, Dr L. Bowerbank, and Dr Brown.

The following Publications have been received :—

A Treatise on the Gout; its Nature and Treatment; being the substance of a paper read before the Medical Society of Guy's Hospital, January 1818. By H. B. C. Hillier, M. C. London, 1848. 8vo. Pp. 23.

Observations on the Cultivation of Organic Science; being the Hunterian Oration delivered February 14, 1848, before the Royal College of Surgeons of England. By Richard Dugard Grainger, F. R. S., Lecturer on General Anatomy and Physiology at St Thomas's Hospital. London, 1848. 8vo. Pp. 60.

Harvey and Buchanan's New and Improved Synoptical Table of the Diseases of the Human Ear, with their Symptoms, Causes, and Treatment. London, 1848.

On Wounds and Injuries of the Chest; being the Third Part of the Lectures on some of the more Important Points in Surgery. By G. T. Guthrie, F. R. S. London, 1848. Large 8vo., double columns. Pp. 109.

Popular Lectures on the Prevailing Diseases of Towns: their Effects, Causes, and the Means of Prevention. Recently delivered at the Brighton Literary and Scientific Institution. Published by general request. By William Kebbell, M. D., Physician to the Brighton Dispensary. Brighton and London, 1848. 12mo. Pp. 196.

On Functional Diseases of the Liver, Associated with Uterine Derangement; embracing the Consideration of Special Physiological and Pathological Relations hitherto unnoticed. By Butler Lane, M. D., M. R. C. S. E., &c. London, 1848. 8vo. Pp. 32.

Clinical Observations on the Pathology and Treatment of Continued Fever, from Cases occurring in the Medical Practice of St Bartholomew's Hospital. By Edward Latham Ormerod, M. B., Caius College, Cambridge, L. of the R. C. of Physicians, Demonstrator of Morbid Anatomy at St Bartholomew's Hospital. London, 1848. 8vo. Pp. 244.

Guy's Hospital Reports. Second Series. Edited by George Hilaro Barlow, M. A. and M. D., Cantab., Fellow of R. C. of Physicians, and Physician to Guy's Hospital; Edward Cock, F. R. C. Surgeons, and Assistant-Surgeon to Guy's Hospital; Edmund Lloyd Birkett, M. D., Cantab., L. of the R. C. Physicians, Curator of the Museum at Guy's Hospital; and Alfred Poland, F. R. C. Surgeons, and Demonstrator of Anatomy at Guy's Hospital. Vol. v. London, 1847. 8vo. Pp. 212.

Report on the Fever of Bona Vista and H. M. S. Eclair. By Dr King. London, 1848. Folio.

Observations on the Report of Dr King on the Fever of Bona Vista. By Dr Ormiston M'William. London, 1848. Folio.

Recent Advances in the Physiology of Motion, the Senses, Generation, and Development. By William Baly, M. D., F. R. S., Physician to Milbank Prison, and Lecturer on Forensic Medicine at St Bartholomew's

Hospital; and William Senhouse Kirkes, M. D. Being a Supplement to the second volume of Professor Müller's Elements of Physiology. London, 1848. 8vo. Pp. 132.

Principles of Medicine: comprising General Pathology and Therapeutics, and a brief general view of Etiology, Nosology, Semeiology, Diagnosis, Prognosis, and Hygienics. By Charles J. B. Williams, M. D., F. R. S., F. of the R. C. Physicians, Professor of Principles and Practice of Medicine and of Clinical Medicine, and First Physician to the Hospital, University College, London, &c. &c. Second Edition, considerably enlarged. London, 1848. 8vo. Pp. 533.

Insanity tested by Science, and shown to be a Disease rarely connected with Permanent Organic Lesion of the Brain, and on that account far more susceptible of cure than has hitherto been supposed. By C. M. Burnett, M. D. London, 1848. 8vo. Pp. 107.

The Microscopic Anatomy of the Human Body in Health and Disease. Illustrated with numerous Drawings in Colour. By Arthur Hill Hassall, Fellow of the Linnæan Society, &c. &c. &c. London, 1848. Nos. 10, 11, 13. Nos. 4 and 6 not received.

On the Nature and Treatment of Stomach and Renal Diseases; being an Inquiry into the connection of Diabetes, Calculus, and other affections of the Kidney and Bladder with Indigestion. By William Prout, M. D., F. R. S., Fellow of the Royal College of Physicians. The Fifth Edition, Revised. London, 1848. 8vo. Pp. 595.

A Descriptive Catalogue of the Preparations, Casts, Drawings, Models, Books, &c. contained in the Museum of the Birmingham and Midland Counties' Lying-in Hospital and Dispensary for the Diseases of Women and Children; Arranged and Edited by John G. Connor, A. C. T. C. D. Birmingham, 1847. 8vo. Pp. 209.

A Descriptive Catalogue of the Anatomical Museum of the Boston Society for Medical Improvement. By T. B. S. Jackson, M. D., Curator of the Museum; Professor of Pathological Anatomy in Harvard University. Boston, 1847. 8vo, Pp. 352.

A Treatise on Diet and Regimen. By William Henry Robertson, M. D., Physician to the Buxton-Bath Charity. Fourth Edition. Rewritten and much Enlarged. Part vi. June 1848. Pp. 241 to 362.

The British and Foreign Medico-Chirurgical Review, or Quarterly Journal of Practical Medicine and Surgery. No. ii. April 1848. London. 8vo.

The London Medical Gazette, or Journal of Practical Medicine, No. 152 and 1060, 24th March 1848, to No. 163 and 1071, 9th June 1848.

Weekly Tables of Mortality for the Metropolis. No. 12, Saturday, 25th March 1848, to No. 23, 10th June 1848. Annual Series, ix.

The American Journal of the Medical Sciences. Edited by Isaac Hays, M. D. &c. No. 30. New Series. April 1848.

The Ethnological Journal; a Magazine of Ethnography, Phrenology, and Archæology, considered as Elements of the Science to Education, Legislation, and Social Progress. Edited by Luke Burke, Esq. London. June 1848. No. 1.

Littell's Living Age. Boston and Philadelphia, No. 201, 18th March 1848. Reprint of the Report of the Trustees of Massachusetts General Hospital, with a History of the Ether Discovery, and ,Dr Morton's Memoir to the French Academy. Edited by R. H. Dana, Jun. Large 8vo. Pp. 529—576.

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ERRATA.

In Dr Stratton's Paper, Vol. lxix., page 255, the thermometric minimum at night for December 1846 ought to be printed zero.

Do. Vol. lxx., page 103, line 39, *for* "typhus" *read* "fever."

Do. „ page 110, line 12, *for* "imperfect regulations causing great sickness," *read* "imperfect regulations imperfectly carried out, the consequences of which are great sickness," &c.

NOTICES TO CORRESPONDENTS.

Communications have been received from Dr **Peebles**, Mr **Edwin Lee**, Dr **Herapath**, and Dr **Bowerbank**. The request of Dr **Bowerbank** shall be attended to.

The following publications have been received:—

A Practical Treatise on the Diseases peculiar to Women. Illustrated by Cases derived from Hospital and Private Practice. By Samuel Ashwell, M. D., Member of the Royal College of Physicians, London, and late Obstetric Physician and Lecturer to Guy's Hospital. Third Edition. London, 1848. 8vo. Pp. 772.

A Course of Lectures on Dental Physiology and Surgery. Delivered at the Middlesex Hospital School of Medicine. By John Tomes, Surgeon-Dentist to the Middlesex Hospital. London, 1848. 8vo. Pp. 397.

Lectures on Diseases of the Eye. By John Morgan, F. L. S., late Surgeon of Guy's Hospital, and Lecturer on Surgery at that Institution. Second Edition, carefully Revised and Enlarged, with Notes. By John F. France, Surgeon of the Eye Infirmary, and Lecturer on Ophthalmic Surgery. London, 1848. 8vo. Pp. 222.

The Treasury of Natural History; or a Popular Dictionary of Animated Nature: In which the Zoological Characteristics that distinguish the different Classes, Genera, and Species are combined with a variety of interesting information, illustrative of the Habits, Instincts, and General Economy of the Animal Kingdom, &c. &c. 900 Woodcuts. By Samuel Maunder. London, 1848. 12mo. Pp. 812.

The Philosophy of Animated Nature; or the Laws and Action of the Nervous System. By G. Calvert Holland, M. D., Physician Extraordinary to the Sheffield General Infirmary. London, 1848. 8vo. Pp. 512.

Outlines of Lectures on the Nature, Causes, and Treatment of Insanity. By Sir Alexander Morison, M. D., Fellow of the Royal College of Physicians, London; late President of the Royal College of Physicians, Edinburgh; Physician to Bethlehem Hospital, and the Surrey County Lunatic Asylum, &c. &c. Edited by his Son, Thomas Coutts Morison, late Resident Medical Officer of the Norfolk County Lunatic Asylum. Fourth Edition, with Plates, much Enlarged. London, 1848. 8vo. Pp. 472.

A Treatise on the Practice of Medicine. By George B. Wood, M. D., Professor of Materia Medica and Pharmacy in the University of Pennsylvania; one of the Physicians of the Pennsylvania Hospital, &c. &c. In Two Volumes. Philadelphia, 1847. 8vo. Pp. 791 and 840.

Practical Observations on Certain Diseases of the Chest, and on the Principles of Auscultation. By Peyton Blakiston, M. D., F. R. S.; Fellow of the Royal College of Physicians; Physician to the Birmingham General Hospital, and formerly Fellow of Emmanuel College, Cambridge. London, 1848. Pp. 368.

School Chemistry; or Practical Rudiments of the Science. By Robert Dundas Thomson, M. D., Master in Chirurgery in the University of Glasgow, Lecturer on Chemistry in the same University, &c. &c. London, 1848. 12mo. Pp. 232.

A Few Thoughts on Cholera, in reference to its Origin, the Nature of the Exciting Cause, and the Principle of Treatment. By Michael Thomas Sadler, Member of the R. C. of Surgeons. London, 1848. 8vo. Pp. 51.

The Periodoscope; with its Application to Obstetric Calculations, and the Periodicities of the Sex. By W. Tyler Smith, M. B., Lond., Obstetric Lecturer in the Hunterian School of Medicine. London, 1848. 8vo. Pp. 47.

Oratio in Harveii Instituto in Aedibus Collegii Regalis Medicorum Habita Die Junii xxiv. MDCCCXLVIII. A Francisco Hawkins, M. D., Coll. Reg. Med. Lond. Socio et Regestario Olim Coll. Di. Jo. Bapt. Oxon. Socio. Londini, 1848. 4to. Pp. 27.

Scriptural Authority for the Mitigation of the Pains of Labour by Chloroform and other Anæsthetic Agents. By Protheroe Smith, M. D., Member of the R. C. of Phys. &c. London, 1848. 8vo. Pp. 52.

Arguments Against the Indiscriminate Use of Chloroform in Midwifery. By S. William J. Merriman, M. D., Cantab., Licentiate of the R. C. of Physicians, &c. London, 1848. 8vo. Pp. 27.

Contributions to the Pathology of the Kidney. By William T. Gairdner, M. D. Edinburgh, 1848. 8vo. Pp. 54.

Continental Travel; with an Appendix on the Influence of Climate, the Remedial Advantages of Travelling, &c. By Edwin Lee, Esq., Member of the Principal European Medical Societies. London, 1848. 8vo. Pp. 353.

Report of the Council of the National Institute of General Practitioners in Medicine, Surgery, and Pharmacy on the Present State of the Medical Reform Question. August 9, 1848. London. 8vo. Pp. 84.

Report of the Recent Progress of Psychological Medicine and Mental Pathology. By C. Lockhart Robertson, M. D. London, 1848. 12mo. Pp. 40.

Index to the British and Foreign Medico-Chirurgical Review, or Quarterly Journal of Practical Medicine and Surgery. Edited by John Forbes, M. D., F. R. S., F. G. S., F. R. C. Phys. London. Vol. xxv. London, 1848.

The London Medical Gazette, or Journal of Practical Medicine. No. 164 and 1072, 16th June 1848, to No. 177 and 1085, 15th September 1848.

Weekly Tables of Mortality for the Metropolis. No. 24, 17th June 1848, to No. 36, 9th September 1848..

Eighth Annual Report of the Registrar-General of Births, Deaths, and Marriages in England. Presented to Both Houses of Parliament by Command of Her Majesty. Folio. London, 1848. Pp. 330.

The American Journal of the Medical Sciences. Edited by Isaac Hays, M. D., &c. New Series, xxxi. July 1848.

The Dublin Quarterly Journal of Medical Science. No. xi. New Series. August 1848.

The Charleston Medical Journal and Review. May 1848. No. 3. Vol. iii. Bimonthly.

The Ethnological Journal. Edited by Luke Burke, Esq. No. iii. August 1, 1848. London.

THE

EDINBURGH
MEDICAL AND SURGICAL JOURNAL.

1st JULY 1848.

PART I.

ORIGINAL COMMUNICATIONS.

Art. I.—*On the Ganglionic System of Nerves.* By C. Radclyffe Hall, M. D., M. R. C. S. Eng., &c. Part Sixth.

The Spinal and Sympathetic Ganglia of the Fifth Nerve. First portion, containing the Gasserian, Ophthalmic, Spheno-palatine, and Salivary Ganglia.

In the parts endowed with sensibility by the fifth nerve, we find many varieties of secreting structure. The sweat-glands and sebaceous follicles of the skin, the crypts and glands of the mucous membrane of the mouth and nostrils, the tonsils and the salivary glands, derive their impressional nerves, and a part at least of their ganglionic nerves, from the fifth. On the first glance, it might appear probable that the spinal ganglion furnished gray nerves to the skin exclusively, whilst the mucous tracts derived their supply from the sympathetic ganglia of the fifth. This, however, is not the case. The sympathetic ganglia of the fifth certainly never supply the skin, but, on the other hand, the spinal ganglion does supply mucous membrane, wherever, in the course of the distribution of this nerve, there is no direct relation between the secretion of the part and muscular movement. The highly vascular pulps of the teeth in both jaws derive their gray nerves from the Gasserian ganglion; so likewise do the lacrymal glands, the conjunctiva, and in part the Schneiderian membrane,—textures quite as dissimilar as the sudoriparous glands and the mucous follicles. Hence, the ganglionic supply for very different tissues may proceed from the same source; there needs not one kind of ganglion for skin, another for mucous membrane, and a third for vascular structure; but all ganglia are alike in kind, and amalgamated or disunited, associated with muscular nerves or otherwise, precisely as the functions of the parts supplied reqnire.

The fifth nerve is the great sentinel of the senses. It guards their outworks, and at the same time excites the defensive operations of their internal machinery. By its reaction on motor nerves, it calls forth the muscular movements required for the perfect exercise of the sense, or for the removal of irritants; by its reaction on ganglionic nerves, it elicits that modification in the action of the vascular and secreting structures which best adapts them either for aiding or for preserving delicacy of perception.

The evidence of the ganglionic reaction of the sensational nerves in general, is founded chiefly on the phenomena of sweating, reaction, and counter-irritation, as presented by the cutaneous surface at large. Similar evidence is furnished by the skin, to which the impressional and ganglionic filaments of the fifth nerve are distributed. Reaction is rapid in proportion to the degree of vascularity and the vigour of circulation; sweating most free under opposite conditions. Reaction from cold or from irritation is most marked in the cheeks; sweating in the forehead. The greater delicacy of the outer covering of the organs of several of the senses, however, affords an opportunity of obtaining more striking testimony respecting ganglionic reaction, than could be obtained from any investigation of the skin alone. A difficulty meets us at the onset, in the plurality of ganglia connected with the fifth. It may not be easy to distinguish whether any given manifestation of ganglionic action is due to the Gasserian ganglion, or to one of the subsidiary sympathetic ganglia. Proceeding by way of exclusion, we must inquire how much of the nervous reaction demonstrable in each of the parts having a double supply, can be justly ascribed to the Gasserian ganglion, and ascertain whether there be not left unexplained sufficient duty for the appropriate sympathetic ganglion.

THE GASSERIAN GANGLION.

Synon.—*Ganglion Semilunare;* named also by Hirsch in 1765 Gasserian (*Ganglion Gasserianum*), after Gasser or Gasserius, Professor of Anatomy at Vienna, and the instructor of Hirsch.

Comparative Anatomy.—The Casserian ganglion exists in all vertebrate animals, and corresponds in size precisely with the development of the sensational portion of the fifth nerve. In mammals, birds, and reptiles, the ganglion is single, although in all it presents more or less appearance of division into segments. In most fishes it is double,—two distinct and separate ganglia being found on each side; in some, as the sturgeon (*Acipenser sturio*), three are met with; in others, as the angler or frog-fish (*Lophius piscatorius*), only one.

In the three highest classes, the respiratory passages have their inlet guarded by the fifth nerve, but derive their own sensational endowments chiefly from the system of the vagus. In fishes, not only is the respiratory inlet, which in them is exclusively the mouth, but the outlet also, *i. e.* the gills, an addition to the breathing apparatus peculiar to them, furnished with sensational filaments by the fifth. The branchial branches of the fifth nerve, and those which assist in forming the long lateral nerve which supplies the muciparous follicles of the back, may require their ganglionic reaction to be distinct from that of the sensational nerves of the head and face. Hence, their Gasserian ganglion is distinct from its fellow. In the absence of lacrymal glands, respiratory nostrils, and of salivary organs, nothing would be gained by constant and direct association of ganglionic action in all the parts to which the very extensive fifth nerve is distributed. There is, therefore, no necessity for the amalgamation of the spinal ganglia into one, as we find it in man. Viewing the *trigeminus* as an aggregate of three great posterior spinal nerves, when their direct association in exciting organic action in the parts they supply is not convenient, each of the component nerve-trunks has its own distinct Gasserian ganglion (the sturgeon); when the association of two of these component trunks, but not of the third, is desirable, there is one ganglion common to the two, and another proper to the remaining nerve-trunk (cod, ray, and most fishes); but when the association of all three nerve-trunks in the induction of organic reaction becomes important and necessary, a single large tripartite ganglion is then placed on all three conjointly (reptiles, birds, and mammals).

We have in this general statement a confirmation of two of our postulates, viz., that the impressional nerve-tubes transmitted by a ganglion do react on the ganglionic cells; and that excitement commencing in one part of a ganglion is communicable to the rest. We shall hereafter find reason to conclude that, in the higher animals, this communicability accords precisely with the degree of structural connection between different portions of the same ganglion.

Connections in Man.—The Gasserian ganglion is the largest spinal ganglion in the body. It embraces all the sensational filaments of the fifth nerve, and constitutes for them a common place of meeting before they diverge to their respective destinations. It has no connection whatever with the motor portion of the fifth; nor with any other motor nerve. It does not receive sensational filaments from any other than its own nerve; nor any contribution from the sympathetic on its cerebral aspect. Filaments from the carotic plexus attach themselves largely to the nerves which emerge on its distal aspect, and some of these, doubtless, proceed to the gray cells of the Gasserian ganglion, to reach which they must pursue for a short distance a retrograde course. The accuracy of this statement would be denied by some. Bock, for example, describes filaments as passing from the sympathetic to the common *portio major* of the fifth, nearer the brain than the Gasserian ganglion. The point seems to be of no other physiological importance than as regards the similarity of the Gasserian to the other spinal ganglia.

Use.—To associate the secreting action of all those parts supplied by the fifth, which are not directly connected with muscular movement, with the impressions made on the fifth nerve, and with the emotional states of the brain conducted by it.

Physiology and Pathology.—Division of the trunk of the fifth nerve in a living animal invariably gives rise to four distinct sets of phenomena, which ensue immediately, though some are afterwards progressive. (1.) Loss of common and of tactile sensation in all parts of the head, deep and superficial, anterior to a line drawn vertically through the *meatus auditorius externus*, with the exception of a small portion of the skin about the angle of the lower jaw, which receives sensational twigs from the cervical nerves. (2.) Loss of motor power in the muscles of mastication supplied by the *portio minor*. (3.) Disturbance of all the special senses. (4.) Disturbance of the processes of nutrition and secretion. Of these effects, the two first are merely what would be predicated from our knowledge of the endowments of the fifth, in common with every other compound sensori-motor nerve; but the influence over the organs of special sense is, in a great measure, peculiar to the fifth. The interference with nutrition is not so; but from the delicacy of the tissues affected, this effect is more manifest and more marked in its consequences than when it proceeds from lesion of any other nerve of common sensation.

There is nothing in the mere experiment to guide us in deciding how much is attributable to abolished function of the fifth nerve, and how much to interference with other nerves through the medium of the fifth. The blindness does not prove that the fifth can ever of itself exercise the function of vision, nor yet that it confers on the optic nerve any special and essential adaptive power, because it does not occur in every case of anæsthesia of the fifth. The dryness of conjunctiva, and deficiency of tears followed by vascular injection and inflammatory destruction of the front of the eye, do not prove that the fifth presides over, nor even that its integrity is essential to, the nutrition of the eyeball, for the same reason. But these phenomena do prove that the fifth nerve has in some way the power to greatly affect special sensation and nutrition, under certain circumstances. To ascertain in what way,—we must investigate the conditions under which the peculiar phenomena do occur, and those under which they do not, and deduce from the comparison the circumstances which are essential to their production.

In some cases of disease, in which there is entire loss of sensibility in the parts supplied by the fifth nerve, the nutrition of the eye undergoes some alteration which leads to destructive action in the cornea, sloughing, and loss of the humours. In other cases, in which the loss of sensibility is equally complete, the cornea retains its transparency, and nutrition appears to be performed as healthily as ever.

Sir Charles Bell attributed the destructive inflammation when present to co-existing palsy of the *orbicularis palpebrarum*, in consequence of the intra-cranial disease, which disables the fifth pair, having implicated the facial nerve. Owing to this, the eye dried and irritated by the exposure, becomes exceedingly prone to take on inflammation. To this it has been objected by Mr Dixon, that we have many instances of anæsthesia recorded, in which, instead of palsy of the facial, there was palsy of the third nerve, producing dropped lid, so that the cornea was constantly covered and protected, and yet sloughing occurred. But it may be questioned whether the eyeball really would be duly protected from external irritation under such circumstances. Having no sensibility to excite the *orbicularis* to move the dropped lid over the front of the eye, devoid of power in its own muscles, the stationary eyeball beneath the dropped lid would be placed in a very different position to the eye voluntarily closed against injury, or shut during repose. The constant application of two unmoving mucous surfaces against each other is of itself a source of irritation; added to which the eye would never be completely covered; there would always remain a line between the lids, at which the front of the eye would be constantly exposed, and, owing to the palsy of the orbital muscles supplied by the third nerve, this exposed part would be nearly always the same. The dryness and irritation thus induced in the exposed part would rapidly implicate the rest, since it cannot be doubted that conservative reaction is lessened in a part which is deprived of its sensibility. We should expect, therefore, that the addition of ptosis and of palsy of other ocular muscles, as well as of the *levator palpebræ*, would render an anæsthetic eye still more liable to destructive inflammation. Nor does Mr Dixon's second objection, "that we every day see patients who have their *orbiculares palpebrarum* muscles paralysed, in consequence of disease of the seventh nerve, without their becoming subject to any inflammation of the eye in consequence," appear more conclusive. For although in this case the eyelids are immovable, the eyeball is perpetually moving, and thus altering the points most exposed, and freeing the surface from irritating particles. Moreover, Sir C. Bell's theory was not that, by exposure alone, a *healthy* eye would suffer destructive action; but an eye in which "the guarding sensibility" is likewise lost.

The real objection to Bell's theory is the fact, that cases of anæsthesia do occur, in which, without any palsy of the muscles, and without the existence of any circumstance additional to the deficient sensibility which could occasion undue exposure of the eye, destruction of the cornea still supervenes. Besides, the gums on the affected side occasionally inflame and ulcerate, although exposure could certainly exercise no influence over them. The result of dividing the fifth nerve within the skull would of itself suffice to establish the point, could we be certain that no other structure was injured than the fifth nerve, since, without any palsy of the orbital muscles, inflammation never fails to attack the front of the eye, provided the animal lives sufficiently long.

According to another hypothesis, the difference in the phenomena is owing to the portion of the fifth nerve, which is the immediate seat of disease, the eye being endangered, or not "in proportion as the disease has, or has not, implicated the Gasserian ganglion." Mr Dixon, however, proves very satisfactorily from *post mortem* examinations, that in one case in which disease is distad to the Gasserian ganglion, sloughing takes place; in another case it does not. In one case in which disease affects the root of the nerve centrad to the ganglion, sloughing occurs; in another, it does not. No example, however, has been recorded in which disease has involved the tissue of the ganglion itself, and yet the eye remained free from disease.

The facts then are these,—violent destruction of the trunk of the fifth nerve invariably induces sloughing of the eye: disease of the fifth nerve, whether at its origin, or at any part of its course, sometimes does, and sometimes does not lead to loss of the eye. Palsy of muscles will not explain this variation, since both effects are met with by turns, where movement is unimpaired. The cause cannot reside in the sensational endowments of the fifth nerve, since sensibility is annulled alike where the eye remains sound, and where it suffers. It cannot depend on the mere implication of the ganglionic filaments themselves, since these must inevitably be so implicated in every instance in which the disease lies external to the ganglion. And as already noticed, there have been cases of this kind in which nutrition was not disturbed. We are reduced to the supposition, that there must be some adequate difference in the kind of disorder induced in the fifth nerve. In anæsthesia, vision may be but slightly impaired, the iris but slightly more sluggish than its fellow, the conjunctiva moist and not injected. In section of the fifth nerve, there is immediate blindness,* with immovable pupil, rapidly followed by destruction of the cornea. In both cases, the functions of the fifth are abolished; but in the former, by gradual and gentle change, and with slight irritation; in the latter, by sudden and rude injury, and with great irritation. When the fifth has been divided at, or peripherad to, its ganglion, the ganglionic cells or filaments themselves may have been directly irritated by the knife. And as Magendie asserts, that the disturbance of nutrition is less in proportion as the nerve-trunk is divided near to its connection with the brain, and greatest when the Gasserian ganglion itself is divided, this direct irritation does appear to exert some influence. But if, as I believe, there be no gray filaments connecting the brain with the ganglion, derangement of nutrition should not take place at all after section of the nerve close to the crus cerebelli until sufficient time had elapsed for extension of mischief to the tissue of the ganglion; nor should it ever occur in disease restricted to the cis-ganglionic portion of the nerve-root.

We infer, that in one case the disease which occasions the anæsthesia, positively disorders the action of the impressional nerves, and through them that of the ganglionic cells and nerves, thereby deranging the organic processes which these superintend. Or, when it implicates all the nerve-fibres, the disease may directly affect the grey nerves as well as the impressional ones. In another case, the disease merely abolishes the power of the nerves, and prevents them from acting at all. In this latter case, nutrition proceeds without let or hindrance, so long as there is no unusual irritation excited, only the power of withstanding injury is impaired in consequence of deficient nervous reaction. In the former case, there is constant irritation from within, which is either sufficient of itself to excite destructive morbid action, or should it fail to do this, at least so far to derange nutrition, that the parts are exceedingly prone to inflame under the slightest external irritation. Sir C. Bell's theory certainly appears from the cases he narrates to be so far correct, that by exposure an eye deprived of its sensibility may be caused to inflame and slough, which, without such exposure, would probably have escaped.

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* If not complete, the blindness is almost so. Slight winking may sometimes be excited by exposing the affected eye to a strong light, the other being covered.

Destruction of the eye invariably follows division of the fifth nerve, because the nerve cannot be thus injured without persistent irritation being induced. When we divide a motor nerve, the muscle supplied by the distal portion twitches for some time afterwards. When we divide a nerve of sensation, pain is experienced for a considerable period. In each of these instances there is thus the natural sign of persistent irritation having been left by the injury. We have not, it is true, inflammation and sloughing of the skin after division of a cutaneous nerve, because, in the first place, the skin is less delicate in its organisation, has larger blood-vessels, and therefore greater power of resisting injury than the cornea; and, secondly, it would be scarcely possible to deprive a given portion of skin of *all* its impressional nerves, or to injure them all without inducing at the same time such injury of other parts as would invalidate our conclusions. In palsy, as formerly remarked, we do meet with certain cases which manifest an active derangement of the organic processes, though not, as in the eye, to the extent of inducing spontaneous ulceration or sloughing.

In the cases of *anæsthesia* accompanied with spontaneous sloughing of the eye, we should expect, if the view I am taking be correct, to meet with some evidence of the existence of active irritation in the fifth nerve; and the sign which immediately occurs to the mind is that of pain. There are cases in which great pain is referred to the branches of the nerve, although these are quite bereft of their normal sensibility; and other cases in which neither pain nor subjective sensation of any kind is experienced. We do not find, however, that the extent of pain, or its duration, bears any relation to the occurrence of morbid nutritive action in the eye. Sloughing of the cornea has occurred both in painful and in painless anæsthesia. Pain, therefore, is not the essential mark of that kind of irritation which deranges the action of the ganglion the most. In this respect, the instance before us but conforms with the general physiology of the nerves. Applications to the skin which occasion the greatest pain do not necessarily induce the greatest ganglionic reaction on the secreting structures; and applications may excite secretion, without occasioning pain. Sensation, therefore, is not in any part an accurate criterion of that excitement of the impressional nerves which calls forth the action of ganglia the most. Were sensation actually the measure of the excitement going on in a sensational nerve-tube, it would follow that the sensational portion of an impressional nerve is not that which chiefly reacts on the ganglion. Yet, as the cerebral nerve-tubes have precisely the same relation to the ganglionic cells that the spinal ones have, there seems to be no reason why any difference should exist in their relative capacity for reacting on the cells, quantity for quantity. In the visceral gangliated nerves, there is reason to believe that in quantity the spinal nerve-tubes far exceed the cerebral. In the nerves of the exterior, the reverse is usually admitted. It may be that this is incorrect; that the impressional nerves of the external surface, as well as those of the interior, do in reality contain a predominance of spinal tubes. We are so much in the habit of taking it for granted that an actual nervous filament must be present in every point in which sensation exists, that we are apt to forget the absence of all proof of this. Copious supply of nerves and increased sensibility certainly go together, but it is probable that fewer nerve-tubes than we suspect are sufficient to endow a surface with a high amount of sensibility. But whatever may be the relative proportion of cerebral to spinal filaments in a given impressional nerve, it is enough for my argument to prove that the spinal nerve-tubes alone, in the absence of sensational activity, are competent to induce ganglionic reaction. The induction of the usual effects of counter-irritation, and of derivation, where the existence of deep coma shows the centre of sensation to be inactive, or where complete loss of sensibility proves it to be palsied, establishes this. In the absence of sensation, therefore, great irritation of the spinal components of an impressional nerve may exist, and excite and disorder a ganglion, although there is no pain to declare it. On the other hand, there may be pain, provided it do not proceed from any outward cause, without corresponding excitement of the spinal nerve-tubes, the irritation being restricted to the sensational filaments, and reacting on the ganglionic cells to the extent of the influence of these only. Yet, if intensity of subjective sensation implied the same irritation of the entire nerve-tubes of sensation, which an equal amount when excited by external stimuli does, we should expect in all cases to see an equal amount of derangement in the organic processes. But this is not so. The most extreme pain is occasionally attended with the smallest disorder of secretion. We must assume, therefore, that intense pain may sometimes be purely centric, and not attended with any equivalent excitement of the nerve-tubes to which the subjective sensation is mentally referred. In other cases, again, the centric irritation differing in its nature may affect differently the sensational nerve-tubes, exciting and deranging their action, and through them that of all parts under their influence. Persistent over-sensibility, tenderness on pressure of the part to which the pain is referred, may perhaps serve to distinguish between the two. In brief, the one condition of pain may indicate very different states of irritation in the centre of sensation; one mode of irritation may be such as to extend to the nervous filaments; another may restrict its influence to the centric cells; and both equally be manifested by pain; yet the effect of the irritation upon distant parts will be very different. A practical inference in *anæsthesia* of the fifth nerve follows,—that we should not anticipate sloughing of the eye, merely from the co-existence of pain, however intense. On the other hand, the entire absence of sensation of every kind would not render the eye at all less likely to suffer, since the disease might be of such a nature and so situated as to mechanically compress the root of the sensational nerve, and yet still to induce irritation in the distributed nerve-tubes, and secondarily in the ganglion through which they pass.

It usually happens in *anæsthesia* of the fifth, that the surface of the eye no longer reddens instantaneously on being irritated. We might suppose in such a case that the vascular injection is absent in consequence of palsy of any of the three constituents of the fifth,—the cerebral, spinal, or ganglionic; or to palsy of all at the same time. Cases of an opposite kind, however, occasionally happen, and furnish us with more precise inferences. In a case of anæsthesia, in which the capillaries immediately respond to external irritation, it might be surmised that although the impressional nerve-tubes are incapacitated, the ganglionic filaments are still able to respond to irritation, and that the redness is induced through their medium alone. Such a conjecture would be very favourable to the function assigned to the ganglia, inasmuch as, if proved, it would demonstrate what at present we can only infer, that a ganglion has within itself the power of influencing organic action. But the conjecture is inadmissible. Were it correct, capillary reaction would never be absent in those cases in which the disease which occasions the anæsthesia of the fifth being nearer to the brain than the Gasserian ganglion, this ganglion and its gray nerves are left free to act. This does not accord with experience. Instances have occurred in which the disease lay at the root of the fifth nerve without involving the ganglion either by direct pressure or by the extension of inflammatory action, and yet during life, the conjunctiva refused to respond to irritation, and the lacrymal gland to sympathise. Here there is no evidence to prove incapacity of the ganglionic cells and of their gray nerves to fulfil all the functions naturally belonging to them; there is evidence only of deficiency of excitement. We must infer that the purely gray nerves are not fitted at their terminations for being stimulated by mechanical impressions made on the surface,—a conclusion, indeed, to which the little we know respecting their organisation at their peripheral terminations would lead us. It remains, nevertheless, an open question, whether the gray nerves may not be fitted for receiving direct stimulation from varied conditions of the capillary circulation, or from varied conditions of the organised molecules with which they are in the closest relation. It must be undetermined, therefore, whether, after mechanical or other irritation has been so long continued on the external surface as to have induced disorder in the molecular action of tissue, the gray nerves may not then sustain direct excitement from the abnormal condition which has been induced; but it seems decided that the *instantaneous* response to irritation, as manifested by injection of the capillaries, cannot take place without the assistance of the impressional nerves.

The gray nerves alone being proved to be insufficient, and the impressional nerves being proved to be essential, to the production of vascular reaction, we have next to inquire whether the effect is due to the sensational portion only, or to the spinal portion only, or to both these components of the impressional nerve, or to one of them in conjunction with the ganglionic nerves.

The occurrence of redness from irritation, notwithstanding sensation is abolished, proves that vascular reaction in health, although then accompanied by sensation, is not an attribute of the sensational filaments alone.

We cannot ascertain what effect might result from excluding the spinal constituents, the sensational filaments remaining active. But, judging from the similarity of their relation to the ganglionic cells, we may fairly assume that in this respect the spinal filaments would precisely resemble the cerebral ones, and that vascular reaction would be presented although the spinal filaments were paralysed,—could such a case occur as that of palsy of the spinal filaments without interference with either the sensational or the ganglionic.

As these considerations furnish materials for an induction more nearly approaching to proof of the law of ganglionic action than we can otherwise obtain, they may be briefly recapitulated in a syllogistic form.

1. The vascular reaction to irritation of the conjunctiva does depend upon the integrity of some part of the fifth nerve, since it ceases when the whole of the fifth nerve is destroyed.

2. Of the three constituents of the fifth nerve, it does not depend upon the ganglionic element alone, since it is sometimes absent when this is intact. It does not depend on the sensational element alone, since it is present when this is incapacitated. That it does not depend on the spinal element alone, we infer from analogy, the test being impossible.

3. It must therefore depend on the conjoint action of at least two of the elements of the fifth nerve; and as it is occasionally presented when the influence of one of the non-ganglionic constituents (the sensational) is suspended, one of the two active elements must in all cases be the ganglionic.

As the only imaginable kind of conjoint operation consists in the reaction in the ganglion of the transmitted impressional nerves upon the cells in which the ganglionic filaments arise, the law of synergetic action is perhaps as nearly proved as the nature of the subject will allow.

We may deduce the practical inference that in *anæsthesia* of the fifth nerve, if the conjunctiva instantly reddens on touching it with the finger, the prognosis may be more favourable, since, although sensation may be entirely lost, the cause of the palsy is restricted to the cerebral portion of the nerve, and does not affect the spinal and ganglionic portions. The disease therefore cannot consist in tumour involving the trunk of the nerve, nor in structural change of the Gasserian ganglion, for either would disable *all* the nerve-fibres at once, but probably depends on disorder of circulation, or on some other remediable cause.

Other phenomena presented by various cases of anæsthesia, become easy of explanation. In one case, there will be merely complete loss of sensibility; the conduction of the fifth nerve is stopped, but without irritation of its fibres. In another, there will be subjective pains, indicating irritation of the sensational centre,—palsy and neuralgia combined. In another, great derangement of nutrition in the parts supplied will be superadded; the disease keeping up constant irritation of the ganglionic filaments either by direct interference, or through the intervention of the impressional nerve-tubes. We can understand how a case of anæsthesia of the fifth nerve shall, for a length of time, present the passive character, and then suddenly, the irritation becoming great and permanent, give rise to blindness and to sloughing of the eye; and why, after remaining opake for some time after injury done to the fifth nerve, where sloughing has not ensued, the cornea may eventually clear up and remain transparent. The irritation caused by the injury passing away, the ganglionic nerves are no longer kept in a state of morbid activity, and cease to derange nutrition, which by degrees resumes its normal state.

It is corroborative of the share which we assign to the ganglionic nerves in the production of disordered nutrition, that we find that results similar in kind, though not in degree, are occasioned by experimental injury of the superior cervical ganglion.

The nerve-tubes proper to the fifth nerve cannot here be directly affected. The irritation set up in the cervical ganglion is transmitted through the communicating gray nerves to the Gasserian and to the ophthalmic ganglion; from these centres radiating along gray nerves of distribution, and interfering with the normal performance of the organic processes, both on the exterior and in the interior of the eye.

THE OPHTHALMIC GANGLION.

Synon.—Ciliary; Lenticular; Orbital: first described by Willis in 1683.

Comparative Anatomy.—Having prefaced the detail of the experiments on which these essays are based, by observations on the anatomy of the ciliary ganglion, a brief statement of the chief points alone is necessary.

Wherever a moveable iris exists, we find a ciliary ganglion, and there only. Consequently we do not find it in fishes nor in the lower reptiles. According to Muck and Bojanus, it does exist in the turtle. In the highest reptile (the crocodile), the point does not seem to have been investigated. The ganglion is present in all birds, and is larger in proportion to the degree of vision possessed, and to the greater mobility of iris which always accompanies this. It is very large, therefore, in birds of prey; small in gallinæ. Whatever may be the case in those subterranean mammals, in which the eyes are scarcely developed (as the mole), and in cetacea, in which, from the flatness of the cornea, and from the absence of any perfect lacrymal apparatus, the eye more nearly resembles that of the fish, an ophthalmic ganglion certainly exists in all the higher mammalia. Its amount of development varies considerably, but corresponds exactly, as in the bird, with the acuteness and power of sight. Large in the feline tribe, it is extremely small in the horse and in rodentia. Muck and Desmoulins deny its existence in the horse. Retzius and Longet affirm the contrary. Desmoulins likewise denies its existence in the guinea-pig and in the rabbit, in both of which Muck, Retzius, and Longet succeeded in finding it. I have found it in each of these animals, but with the greatest difficulty in the horse.

The connexions of the ciliary ganglion are essentially the same in all animals in which it is met with.

Connections in Man.—It receives a short thick root from the lower division of the third nerve, and a long slender root from the nasal branch of the fifth nerve. Occasionally, a gray root proceeds to it either from the carotic plexus, or less frequently from Meckel's ganglion. Sometimes a contribution appears to come from the sixth nerve; but in this case, the sixth nerve has previously been connected with the fifth, and but serves as a conductor of a few filaments of the latter which have pierced its neurilem.

It furnishes a number of ciliary nerves which are distributed to the vascular and muscular structures in the iris, the vascular rete of the ciliary processes, and probably the vascular tissue of the retina. According to Tiedemann, a filament accompanies the *arteria centralis retinæ* in the substance of the optic nerve.

Analysis. — *Impressional Element.* — From the fifth nerve through the long root given off by the nasal branch.

Impressional Distribution.—Assumed to be to the surface of the iris, the surface of the retina, and a small portion of the exterior of the eyeball around the margin of the cornea.

Motor Element.—From the third nerve through the short root.

Motor Distribution.—To the sphincter muscle of the iris.

Ganglionic Connection.—The carotic plexus through gray nerves which pass either in the sheath of the other roots, or else as a distinct gray nerve.

Ganglionic Distribution.—Assumed to be to the creotile tissue of the iris and of the ciliary processes at its base, and to the vascular tissue of the retina.

Use.—To associate the degree of capillary fulness in the iris, ciliary processes, and retina, with impressions made on the common, as distinguished from the visual sensibility of the eye on the one hand, and with the contraction of the pupil on the other.

Physiology and Pathology.—As it would be difficult to point out all the physiological relations of each of the subsidiary ganglia of the fifth nerve, without allusion to the influence of other portions of the nerve besides those directly related to the ganglion in question, under this head will be comprised a sketch of the general nervous reactions of the supplied part, the distinction between the reaction of the spinal and that of the sympathetic ganglion being kept in view.

A blast of cold wind against the eye causes first uneasy sensation, and immediately afterwards redness and flow of tears, and of thin mucus. This aptly illustrates nature's most common mode of removing a source of irritation; the irritated impressional nerves react on the ganglionic ones, and through them induce an increase in the natural excretion of the part.

More continued and extensive reaction is manifested when any irritating particle becomes lodged beneath the eyelid. There is pain; the eyelids are squeezed together from spasm of the *orbicularis;* the conjunctiva is red from general injection of its vessels; and its surface is moistened partly from increase of its own mucous secretion, but principally from tears. Should the irritation continue, intolerance of light and dimness or confusion of sight ensue; the pupil contracts; the eyelids become red and tumid from serous exhalation into the lax areolar tissue in which they abound; the Schneiderian membrane becomes more sensitive, and subsequently swollen, and more active in the excretion of its mucus, producing sneezing and obtunded sense of smell. In this very common series of phenomena, we have illustrated the three modes of nervous reaction.

The first reaction is that of the irritated impressional nerves upon the ganglionic cells most closely related to them, inducing vascular injection of the part irritated; and at the same time reaction on the organic nerves of the lacrymal gland, causing flow of tears. The lacrymal nerves may be inferred to have a very general relation to the whole of that part of the Gasserian ganglion belonging to the first division of the fifth nerve, since lacrymation ensues instantly on stimulating *any* portion of the pituitary or ocular membrane. This ganglionic reaction takes place in the Gasserian ganglion. As the irritation extends, the portion of ganglion proper to the second division of the fifth becomes involved, and the secreting action of the nostril on that side is affected. The excitement seems but seldom to spread to the third division of the ganglion, which is rather more isolated than the rest, but occasionally, when lacrymation is copious, there does occur increased secretion of saliva, indicating that the gray nerves which accompany the infra-maxillary nerve participate in the excitement of the rest.

The second reaction, occurring, indeed, simultaneously in point of time with the first, is that of the irritated impressional upon the motor nerves; inducing closure of the eyelids through the facial nerve, but *not* contraction of the pupil. This does not supervene until, by extension of excitement to the origin of the optic nerve, or else by organic reaction upon the vessels of the retina, the special sense of sight has become implicated. When the sensitiveness to the air induced in the nostrils has occasioned sneezing, the general set of respiratory nerves are implicated. This motor reaction takes place in the cerebro-spinal centres.

The third reaction consists in the spreading of the excitement from the sensational filaments first irritated to others; first, to the cell-origins of those immediately adjoining, and subsequently to those farther off. Thus, the uneasiness extends first to the whole surface of the eye; next, to the eyelids, forehead, and nostril of the same side; and after some time, to the whole of that side of the head and face. This sensational reaction is purely cerebral, taking place in the sensational centre.

It may be a question how far the implication of the several sensational nerves depends upon the spreading of irritation at their cell-origins, and how far it is induced and maintained by the altered condition of the part in which the sensational filaments are distributed, which has been set up in virtue of the ganglionic reaction modifying nutrition. Could we ascertain distinctly the order of events,—whether the uneasy sensation always precedes the altered secretion, or the alteration of secreting surface precedes the uneasiness,—the question would be readily solved. But so far as we can learn, the derangement of sensation and of secretion arise and proceed together, mutually influencing each other both in progress and in termination. In this, as in every similar inquiry, our investigations are crippled by the facts, that we cannot find a nerve of sensation without a ganglion upon it, and that we cannot prove that a ganglion is incapacitated for acting in any case in which the sensational filaments which pass through it are not palsied. Hence, in the eye we cannot evoke either sensational action or ganglionic action distinct one from the other. But in parts less apt to respond to irritation than the eye and the nostril, there is often an appreciable interval between the supervention of pain and that of modified vascular action. After severe headach, for example, has continued for some time, without crying the eyelids will sometimes become tumid. Here, the nerves of sensation are irritated in consequence perhaps of some gastric disorder* conveyed to the centre of sensation through the vagus; but there can have been no alteration of the skin of the eyelids to modify sensibility. The centric irritation of the fifth nerve has affected the ganglionic filaments which superintend nutrition, and the disorder is manifested by the part whose organisation enables it to show the slightest disorder most readily,—the exhaling areolar tissue.

We infer that there is a reaction of one impressional nerve upon another from the spreading of excitement at their origins. And we assume that the impressional nerve-tubes thus secondarily stimulated at their centric connection will produce a similar reaction on any ganglion through which they pass, as if they had themselves been primarily stimulated at their peripheral termination in the ordinary way.

The tripartite division of the Gasserian ganglion is conformable to these laws. The portion belonging to the infra-maxillary nerve is more distant and more distinct from that which furnishes the lacrymal nerves than is the portion belonging to the supra-maxillary nerve; the ophthalmic nerve is more closely related to the ganglionic origin of the lacrymal nerves than either of the others. A similar relation doubtless exists in the brain: the impressional nerves of the eye and its appendages will be connected with their centric cells in immediate proximity to each other; next will arise the impressional nerves of the nose, palate, and cheek; and farther off in succession those of the tongue and lower jaw. We find accordingly, that irritation of the mucous membrane supplied by the infra-maxillary nerve less readily excites lacrymation than does irritation of the nostrils. Tears flow more readily from a pungent odour than from a sharp taste; most readily of all from irritation of the eye. The effects of spreading excitement in the cells of the brain upon the impressional nerves, and of similar spreading in the cells of the Gasserian ganglion upon the gray nerves, which supply the lacrymal gland, will therefore always coincide.

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* I have a patient in whom a dose of iodide of potassium invariably produces this effect.

In perfect anæsthesia of the fifth, the patient is unable to weep with the affected eye, either from emotion or from local irritation. This appears to prove satisfactorily that emotion acts centrifugally on the lacrymal nerves.*

In severe neuralgia of the first branch of the fifth, there is not unfrequently copious lacrymation restricted to the side affected. Thus, with excitement of the nerve, there is excess of secretion; with palsy of the nerve, defect of secretion,—demonstrating that the fifth nerve has in some way considerable influence over the secretions of the lacrymal gland.

The eye possesses means of defence both without and within. In it, as in the other senses, the means for defence and the means for adaptation are the same. Externally, by increased secretion of mucus on the conjunctiva, any foreign body is prevented from adhering, whilst the movement of the eyeball and lids upon each other are facilitated, and, by augmented flow of tears, the source of irritation is washed off. Thus, the impressional, the motor, and the ganglionic nerve actions are all essential to the preservation of the exterior of the eye. Why then are not the motor as well as the impressional nerves closely related to the ganglionic, here, since all so frequently co-operate in their action? They do not invariably co-operate; weeping often occurs from mental causes, without being accompanied by winking or by closure of the lids. But the chief reason why the muscular nerve of the lids is disconnected with the ganglion which supplies the conjunctiva and the lacrymal gland, is the fact that the *orbicularis palpebrarum* is a voluntary muscle, and as such is constantly employed when the conjoint influence of the organic nerves in promoting secretion would prove inconvenient. Hence it is that the lacrymal gland has no small sympathetic ganglion of its own, as some other glands not more important have.

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* Does the eye furnish an illustration of centrifugal action in a nerve of special sense by what not unfrequently happens in the exercise of vision? Every one must have remarked, that an object gazed at with no particular earnestness will occasionally appear dim and ill-defined, and then be seen again more clearly in consequence of a distinct effort of the will. Sometimes this may happen from the front of the eye being dry or obscured, requiring winking to clear it; or from mental abstraction, needing merely a roused attention. But it is not always so. In my own person, without any alteration in the position of the eye or eyelid, or in the desire to attend mentally, by an effort of which I am conscious, but not attended with any feeling of change in the state of the eye or its muscles, I can change the sluggish vision from dim to clear. The pupil lessens slightly with the change. Assuming that the effort consists not in any focal adjustment through the ocular muscles, but in a freshening up of the retina through the nerve of sight, the circumstance is intelligible enough. In a very interesting account of the effects of a poisonous dose of belladonna, as experienced in his own person, Dr Gray of New York describes, amongst other disorders of the nervous system, the following:—"Now came on the affection of the eyesight, every object growing dim as though a cloud were between the eye and it. Sometimes objects appeared double, and with an undulating motion passed before the eye. *I observed, that, by a strong effort of the will, a concentration of the nervous power, this paralysis of the retina might for a moment be combated;* but only to return with greater severity when the mental effort had been succeeded by its corresponding relaxation."—Lancet, for November 1845.

Lacrymation is induced in three ways: (1.) by local irritation of the parts supplied by any of the branches of the fifth nerve; (2.) by mental emotion; (3.) by pain sufficiently intense in any part.

In the first way, independently of pain, the organic reaction on which the increased secretion depends, is due simply to the common relation of the trunk of the fifth nerve to its spinal ganglion, from which the lacrymal gland derives its ganglionic supply. In the second and third way, the reaction in the ganglion is secondary to excitement in the brain, and must depend on centrifugal action of the root of the fifth nerve imparting excitement to the ganglionic cells. In no instance is there any direct and necessary connection with muscular movement. A sympathetic ganglion, consequently, is not required, since the spinal ganglion will not merely answer every purpose as an organic centre, but will also admit of a more extensive relation with the impressional nerves of neighbouring parts than could otherwise be readily obtained. Tears being the natural indication of irritation of a nerve of sensation, no inconvenience results from an acrid taste causing flow of tears, but there would be great inconvenience if every slight irritation of the conjunctiva were to induce sudden flow of saliva. The salivary glands have special ganglia independently of that of the fifth nerve; the lacrymal gland has not.

The internal means of defence are just as efficient in obviating the effects of the only irritant to which the interior of the eye, under ordinary circumstances, can be exposed, viz., an excessive quantity, or an over-stimulating kind of light. The chemical and calorific rays irritate the filaments of the fifth nerve, which terminate in the conjunctiva, as well as those which supply the interior of the eye. This stimulation of the fifth on the exterior reacts in the brain on the seventh nerve, causing closure of the eyelids; the stimulation of the interior affecting those filaments which are related to the ciliary ganglion, induces reaction on the ganglionic nerves (but not on the third nerve), inducing an altered state of the vascular tissue in the eye (but not contraction of the pupil). The light at the same time producing its specific effect upon the retina, reacts through the optic nerve upon the origin of the third nerve, causing contraction of the pupil. As the iridal motor filaments of the third nerve pass through the ciliary ganglion, they react there on the ganglionic nerves already stimulated by the retinal filaments of the fifth nerve.

It may appear singular that the cells of the ciliary ganglion should be influenced alike by an impressional and by a motor nerve, which, although they conspire in action to effect a common purpose, yet do not react upon each other during the juxtaposition of their filaments in the ganglion, nor at their origin in the brain; the fifth nerve exciting the facial and not the third, the third responding to the optic and not to the fifth.* But the singularity disappears when we consider that the stimulation and the reactions of the several nerves are simultaneous, not successive.

Intolerance of light may be twofold; uneasiness from exposure of the surface of the eye to the contact of air and light, and distress from admitting the rays of light into the eye. Both kinds are equally due to irritation of the fifth nerve. Disorder of the optic nerve produces disorder of sight, and secondarily vertigo and other derangements of feeling in the brain, but not pain in the eyeball. Real photophobia, therefore, must in all cases be referred to excitement of those filaments of the fifth nerve which supply the retina. As these pass through the ciliary ganglion, they react, through the gray nerves, on the vascular tissue of the retina, thus conjoining with the increased sensitiveness to light as an irritant of the common sensation, increased sensitiveness to light as an excitor of vision, and the usual state of the iris which excitement of the optic nerve induces.

The ophthalmic ganglion is involved in the focal adjustment of the eye. For near vision, the eye must be lengthened from before to behind so as to increase to the necessary extent the distance between the sentient focal screen and the lenses; or, otherwise, the lenses must have their refracting power so increased as to converge the rays to a point at the original distance. Perhaps neither mode is adapted to the exclusion of the other. Near vision is difficult vision. We are conscious of an effort, and the pupil is contracted at the time. The effort consists in the conjoined action of the ocular muscles, by which the eyeball is slightly elongated from before to behind, and in this way the first element of increased focal distance is obtained. The veins of the eyeball, being compressed, cease to return their blood, whilst the uncompressed ophthalmic artery ceases not to convey it; fulness of the *vasa vorticosa* and of the vascular web of the iris and ciliary processes ensues, and, owing to the unyielding nature of the sclerotic coat, exert pressure on the contents of the eyeball. The vitreous humour, thus subjected to unusual pressure, maintains a due sphericity of the retina, and is itself increased in density, and to a corresponding extent probably in refracting power. The contraction of the pupil, and the turgid state of the vessels of the base of the iris and of the ciliary processes, to which the capsule of the lens adheres, cause some slight advance of the crystalline. The cornea, pressed from behind by the contents of the globe, is pushed forward at its centre, whilst it is drawn backward at its circumference by the action of the ocular muscles. In this way it is rendered more convex, and more powerful as a lens. Thus, by several changes, we obtain the second element of increased refracting power in the lenses. But it is not probable that the vascular distension thus assumed is due solely to passive fulness occasioned by compression of the ocular veins. Favoured by this, we must also admit the active influence of nervous excitement upon the capillaries in producing a *turgor vitalis* analogous to that of other erectile tissues. With this assumption alone can we explain the action and use of the marsupium in birds, and of the choroid gland in cartilaginous fishes.

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* I believe that a special provision for this reaction exists in a fasciculus of white fibres which pass across the *crus cerebri* from the *nates* to the point at which the third nerve arises. Vide Pl. viii. Fig. 26, with the correction appended to Part v., Edin. Med. and Surg. Journal, Vol. lxviii. p. 172.

The focal adaptation of the eye then consists (1.) in altered distance between its outworks and its nerve; (2.) in modified density of its refracting media, or, in other words, in altered tension of its membranes. We shall find the adaptation of the ear to be fulfilled in a manner precisely similar.

The nervous reactions on the internal structures of the eye resemble those excited by emotion in the circumstance that they can be indirectly influenced by the will. We cannot, by a voluntary effort merely, cause the iris to contract; but by willing *to see* some object imagined to be very near, we can; although not to the extent which the object itself in the position imagined will. Hence, by voluntarily influencing the centre of sensation we can induce some reaction; but by exciting the sensational centre from without by its proper stimulus, we induce much more. The contraction of pupil is all that we can see, but, no doubt, a corresponding change takes place at the same time in the capillary system presided over by the ciliary ganglion. It is important, therefore, for the sake of the conformity to other ganglia, to prove that the reaction is never *directly* voluntary.

Twigs from the ganglionic ciliary nerves are distributed to the retina, the iris and ciliary processes, and to a small zone of the sclerotica immediately around the cornea. Hence the extension of inflammatory action from the surface of the eyeball to the iris, and from the iris to the retina, is favoured both by inosculation of vessels, and by the distribution of the same set of nerves to each. The same circumstance also explains the influence of exposure to cold in keeping up morbid sensibility of the retina; the benefit derived from residence in a warm climate in many cases where iritis has left behind it more or less alteration of the internal structures of the eye; and the rationale of using outward applications in internal affections of the eyeball.

The iris is affected in its action by varied states of the optic and third nerves, and of the brain, irrespective of the ciliary ganglion. But it may also be affected through the intervention of the ciliary ganglion, whenever the reaction of that centre affects the retina. Thus many visceral derangements (*e. g.* worms) produce contracted, or, what is far more common, dilated pupils. The disorder is imparted through the medium of the sympathetic directly to the cells of the ciliary ganglion in common with the rest; the gray nerves affect the vessels of the retina; the retina affects the iris.

In every instance of sympathetic amaurosis or dimmed vision, in which there is no reason to suspect cerebral lesion, the retina may be affected through the ciliary ganglion. The ciliary ganglion is itself affected through the fifth, or through the sympathetic nerve, according as the primary irritation resides within the sphere of one or the other. The fifth nerve is peculiarly liable to sensational reaction. Irritation affecting one set of filaments frequently spreads to others; thus, the irritation of a carious tooth—of matter pent up in the antrum—of a cicatrix or tumour involving a branch of the fifth,—may so react on the origin of the filaments which pass through the ciliary ganglion as to derange its action. Or the irritation may be applied directly to the filaments in question, as in centric neuralgia, or in lesion of the trunk of the fifth. Each of these conditions has caused blindness. In uterine or gastro-intestinal derangements, the retina may be affected through the intervention of the sympathetic reacting on the ciliary ganglion.

We conclude that all the organic nervous reactions which are manifested by the exterior of the eye, and by the lacrymal gland, have their centre in the Gasserian ganglion; whilst those which take place in the interior of the eye, and affect the state of circulation in the vascular parts of the retina, ciliary processes, and iris, have their centre in the ophthalmic ganglion.

THE SPHENO-PALATINE GANGLION.

Synon.—Sphenoidal; Nasal; Rhinic; Meckel's Ganglion; first described by Meckel in 1749.

Comparative Anatomy.—Not present in fishes, as, from the absence of posterior nares, we should anticipate. Absent also in the true amphibia, and in chelonian reptiles. Its existence in saurians is not ascertained, but in some ophidians it is found largely developed. In the non-venomous serpents (as the boa), two distinct ganglia are found in connexion with the second division of the fifth nerve where this is joined by filaments from the sympathetic. These may be considered as homologous to Meckel's ganglion, unusually developed to meet an unusual requirement. They supply the whole of the mucous membrane of the palate and roof of the mouth, and of the posterior nares. During the violent efforts of the snake to engorge its prey, a free secretion of mucus in the mouth and fauces is necessary in order to besmear and lubricate the food sufficiently. And in the peculiar arrangement of the lacrymal apparatus of the non-venomous snakes, we perceive an additional mode of fulfilling the same purpose. The lacrymal gland is very large, and lies behind the eyeball; its secretion after washing the front of the eye is conveyed by a lacrymal duct, not into the nostrils, but into the mouth. The lacrymal gland is supplied, not by the ophthalmic division of the fifth nerve, as in man, but by the ori-nasal (the second) division, on which the palatal ganglia are placed. Hence, when the over-stretched mouth communicates its irritation through the impressional nerves of the fifth to the palatal ganglia, and thereby excites a copious discharge of mucus, it also excites, through the medium of the same nerves, organic reaction in the Gasserian ganglion on the lacrymal gland. The flow of tears thus excited first allays the irritation of the squeezed and projected eyeballs, and secondly, adds to the moistening of the mouth. In comparing the snake with the turtle, Mr Swan points out that in the snake the supply from the sympathetic to the second branch of the fifth is very large, and the two palatal ganglia exist, whilst in the turtle, comparatively few sympathetic filaments can be traced to join the second branch of the fifth nerve, and there are no palatal ganglia.* He adds, "But in this creature, the palate is horny, and not so extensive in proportion to the size of the head." The real reason, it appears to myself, depends upon the difference of feeding, and consequent difference in the mode of deglutition, of the two animals.

Birds do not possess a spheno-palatine ganglion. The absence of a *velum palati,* and the existence of a special gland either on the forehead or within the orbit, for lubricating the nostrils, may account for this.

In mammalia a spheno-palatine ganglion is very generally present. Of all animals, it is most highly developed in man, in whom it is the largest of the sympathetic ganglia of the fifth nerve, and forms a distinct "reddish, firm, triangular or heart-shaped body, flattened internally next the nasal wall, convex externally" (Meckel). In some animals in which its presence has unjustly been questioned, the error may have arisen from expecting to find a ganglion similar in appearance to that of man. This is not met with in any other animal, but something homologous may usually be detected. Thus, Weber failed to discover any spheno-palatine ganglion in the calf. In the ass, it is stated by Mr Swan not to exist; and even in the baboon and the monkey there is no such distinct ganglion as in man. It does exist, however, in the calf, as in other herbivora, in the form of several nodules connected together, which lie wedged in amongst the strands of the supra-maxillary nerve, on its inner aspect. In carnivora, the ganglion is very different. Flat and expanded, it lies in a slanting direction on the floor of the orbit, internal to the second branch of the fifth. Mr Swan remarks that the ganglion is more especially connected with the "lateral nasal nerve" (the naso-palatine) in the jaguar and calf, but equally with the nasal and palatal nerves in man, the baboon, and the monkey, and refers this to the circumstance of the former animals deriving great advantage from the sense of smell in procuring their food, whilst the latter trust to their more exquisite sense of taste. "It is probable that the sense of taste is more exquisite in man than in any animal, and the surface of the palate may have nicer and more uniform perceptions from the previous change of the nerve in a ganglion; it may have likewise a closer association with the Schneiderian membrane." There are no grounds, however, for assuming any closer relation of the spheno-palatine ganglion to the sense of taste than what arises from the importance of a duly moistened condition of the Schneiderian and palatal membranes to the sense of smell, and the participation of smell in the act of tasting. And in herbivora, although the ganglion appears to be more exclusively appropriated by the nasal nerves, it still possesses a direct connection with the mouth through the medium of the naso-palatine nerve. The anatomical difference, therefore, is not that the ganglion possesses no connexion with the oral cavity, but that it possesses less connexion with the soft palate than in man. The soft palate is in constant movement during deglutition, but it is in more active movement still during articulation of the voice. To man this latter function is peculiar, and in man therefore are additional means required for maintaining a moist and supple state of the *velum palati.*

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* Comparative Anatomy of the Nerves, p. 66.

Connections in Man.—The spheno-palatine ganglion receives one, two, or three nerves from the second division of the fifth, which lies above it; and a large compound nerve, the Vidian, which emerges from the pterygoid canal. It furnishes nasal nerves to the mucous membrane of the posterior part of the nostrils; pharyngeal nerves to the pharynx, Eustachian tube, and sphenoidal cells; three descending palatine nerves to the tonsils, soft palate, gums, and to the elevating muscles of the *velum*, viz., *axygos uvulæ* and *levator paleti*; and the long naso-palatine nerve. This courses along the *septum narium*, approaches its fellow in the anterior palatine canal, but does not form with it, as H. Cloquet affirmed, any ganglion, emerges on the roof of the mouth, and there terminates.

In addition, it is stated by Tiedemann that he once found in man a nerve which passed directly from the spheno-palatine to the ciliary ganglion. Arnold also discovered in the calf three or four very delicate filaments which passed up into the orbit and attached themselves to the sheath of the optic nerve, and appeared to follow the course of the *arteria centralis retinæ*. These occasional variations, if they be so, serve to indicate that the source of ganglionic supply is comparatively unimportant when no very intimate functional association with other parts is required.

Analysis.—Impressional Elements.—From the second branch of the fifth nerve; and through the Vidian nerve from the glosso-pharyngeal and vagus.

Impressional Distribution.—To the nostrils, sphenoidal cells, pharynx, soft palate, tonsils, roof of the mouth, and gums.

Motor Element.—From the facial and glosso-pharyngeal nerves through the Vidian.

Motor Distribution.—To the *axygos uvulæ* and *levator palati.*

Ganglionic Connexion.—With the carotic plexus through the Vidian.

Ganglionic Distribution.—To the posterior third of the Schneiderian membrane, to the sphenoidal cells; Eustachian tube; the mucous membrane on both aspects of the *velum palati;* the tonsils, gums, and roof of the mouth.

Use.—To associate the secretion of the several lubricating surfaces it supplies with the impressions made on the impressional nerves, and with the motions excited through the motor nerves, which pass through it.

In his original paper, Meckel figures and describes a palatine nerve as arising from the trunk of the supra-maxillary nerve, and having no connection with the ganglion. Longet also points out that the greater portion received from the fifth nerve passes by the ganglion into the palatine nerves without entering it. This fact is interesting, inasmuch as it proves that it is not every point supplied by the palatine nerves which has a direct connection with the ganglion, and which, consequently, if excited by impressions restricted to itself, will elicit instantaneous ganglionic reaction.

The Vidian is a highly compound nerve. It derives filaments from five sources; and consists of six elements. It obtains motor filaments from the *portio dura*, and also from the glosso-pharyngeal; impressional filaments from the fifth, after these have traversed the spheno-palatine ganglion, and from the glosso-pharyngeal and vagus; and gray filaments from the carotic plexus.

In palsy of the facial nerve depending upon cerebral lesion, and, therefore, sufficiently high up to involve any branch given off near its origin, there is wryness of the soft palate from palsy of its elevating muscles on the same side, proving that these muscles do receive filaments from the facial, and such filaments could only arrive through the Vidian.

In experimental irritation of the root of the glosso-pharyngeal within the skull, movements of the soft palate are excited, proving the same with respect to this nerve.

In experimental section of the semicircular canals in the pigeon, Flourens found that acute pain was occasioned. These acoustic canals do not appear to receive filaments from the fifth nerve in any more direct manner than through the Vidian.

The grounds for assuming impressional elements from the glosso-pharyngeal and vagus are purely conjectural. That the palatine nerves contain filaments from the glosso-pharyngeal is inferred from the gustativeness of the soft palate. If so, these could arrive only through the Vidian.*

Physiology and Pathology.—The mouth and the nostrils are intimately connected in most of their actions. Through the intervention of Meckel's ganglion, which is common, in some measure, to both, any stimulation of one affects the state of secretion of the other at the same time. When the food during mastication perpetually comes in contact with the roof of the mouth, it makes an impression on the terminal filaments of the long naso-palatine nerve, and by the reaction of these filaments in the spheno-palatine ganglion, it excites increased secretion in the mucous follicles of the palatine membrane where the impressions are made; and also to some extent in the Schneiderian membrane, to which the *naso-palatine* nerve distributes filaments in its course. By the nostrils being thus fitted for the nice appreciation of odour at the same moment that gustation is exercised, we gain all that is required for converting taste into flavour.

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* According to Valentin, there reach Meckel's ganglion, through the Vidian nerve, certain primitive filaments of the superior cervical spinal nerves, which, after passing through the superior cervical ganglion, have ascended in the carotic plexus. Others of these filaments, instead of joining the Vidian nerve, attach themselves to the ophthalmic branch of the fifth nerve, and ultimately enter the ciliary ganglion through its long root. These are supposed to be spinal in their origin, and to preside over the dilating movement of the iris. I do not myself see reason for admitting such a contribution in either case.—De Funct. Nervor., pp. 22, 111.

Having reached the back of the mouth, the food next stimulates the posterior palatine nerves, and induces through their ganglionic reaction augmented secretion in the soft parts adjoining. And here there is a more direct connection between the functional activity of the tongue and the state of the nostrils in the circumstance of the distribution of filaments from the glosso-pharyngeal nerve to the *velum palati*, after they have passed through Meckel's ganglion. Exciting the sense of taste when they are stimulated by the contact of sapid bodies with the soft palate, these filaments react during the deglutition of food on Meckel's ganglion, and affect through it the mucous lining of the posterior nares; occasioning precisely that amount of moistening which best accords with the function of the olfactory nerve. The glosso-pharyngeal also reacts in the cerebro-spinal axis on the motor nerves which govern the movements of deglutition. These nerves, presiding over automatic movements, are involuntary and gangliated, and excite through their respective sympathetic ganglia increased mucous secretion in the fauces and œsophagus. But the greater portion of the impressional filaments contained in the posterior palatine nerves belong to the fifth, whose motor reaction is by preference on the facial nerve. The branches which supply the elevating muscles of the *velum* respond to impressions made on its mucous surface, and move the *velum* automatically as these impressions may dictate. As the movement of the soft palate can never be required without due lubrication of its surface being desirable at the same time, the muscular nerves pass through Meckel's ganglion, and so connect inseparably mucous secretion with muscular movement. This is true alike of the filaments derived from the facial, and of those from the motor root of the glosso-pharyngeal. Hence Meckel's ganglion is doubly excited whether the impression be made on the anterior two-thirds of the tongue, and therefore chiefly on the fifth nerve which reacts on the facial; or on the posterior part of the tongue, and therefore on the sensational portion of the glosso-pharyngeal, which reacts on the motor portion of the same nerve.

The glosso-pharyngeal has been considered as peculiarly the nerve of nausea, but on hypothetical grounds. We may conjecture that when nausea is excited by contact of substances with the fauces, it is the impressional filaments of the vagus which are more especially implicated. Such a view is at least in accordance with the series of phenomena to which nausea gives rise. The flow from the salivary glands, the augmented secretion from the nasal, faucial, and buccal mucous membranes which nausea excites, would, through the vagus, be directly associated with increase of secretion in the bronchia, œsophagus, and stomach. There would also be reason for an impressional contribution from the vagus to Meckel's ganglion, and through this to the parts which it supplies.

There is another and more important reason for the addition of the vagal to the other constituents of Meckel's ganglion, viz., the association of the different parts of the air passages in the office of speech. Considering the barrier to correct modulation of voice which a very slight alteration in the Schneiderian membrane interposes,—the essentiality of combining the motions of the soft palate with lubricity of the fauces, tongue, cheeks, and probably also of the Eustachian tube and tympanum,—the dependence of correct intonation upon correct hearing, and of correct hearing upon a suitable state of the middle ear,—the necessity of a contribution from the nerve of voice to each of these parts becomes obvious. During the production of articulate sounds, the motion imparted to the breath in the larynx causes impressions to be made on the laryngeal filaments of the vagus. By centric spreading, the excitement of these laryngeal filaments affects others, and so induces activity of the various secreting surfaces to which they are distributed, and on which they confer impressibility. In this way, during energetic speech, the tympanic, nasal, faucial, and oral passages are kept free and moist for the conduction of sound in exact proportion to the vehemence of the vocal effort.

The defensive movements of the nostrils are those several modifications of expiration and inspiration, known as snorting, sneezing, and snuffing. More needed by other animals than by man, these acts each require a corresponding increase of secretion for the removal of the offending substance which excites them. By the passing of the impressional nerves through Meckel's ganglion, such an effect on the secretion is directly produced. But as man alone requires the nice and accurate harmony between moistness of surface and action of muscles necessary for vocalization and speech, in man only is the spheno-palatine ganglion fully developed, and its connections with the nerves of the ear and of the larynx numerous and complete.

Increase of secretion can scarcely ever be required on either surface of the *velum palati* without muscular motion being necessary at the same time. And if required to move at all, the *velum* may, without disadvantage, have both its surfaces more lubricated at once. Hence, both nasal and oral surfaces have their impressional and their gray nerves in common. Indeed, the whole of the back part of the mouth and the posterior nares for the most part have their state as to secretion closely associated.

In sneezing, the sentient filaments of the fifth are irritated; these, by their reaction in the Gasserian ganglion, induce free secretion in the nostril, and, by their reaction in the brain on the facial nerve, cause contraction of the muscles of the soft palate. By the simultaneous and combined action of these muscles so induced, the velum is tightened and pressed against the dorsum of the tongue at the moment when the excited action of the other muscles of respiration requires an open passage from the trachea to the nostrils.

It will be noticed that the outworks of the nostrils, like those of the mouth, ear, and eye, have no supply of nerves from a sympathetic ganglion. They are placed under the dominion of the fifth nerve, and derive their gray nerves from its spinal ganglion. Any irritant applied so near to the exterior is within the sphere of voluntary muscles, is removed by their combined action, and could not, without inconvenience, be placed beyond the control of the will. Were the part supplied by a sympathetic ganglion, its secretion must be conjoined with involuntary muscular action, and any increase of secretion resulting from the presence of irritation would invariably be associated with expulsive muscular effort, whether desired at the time or otherwise. A man could not take snuff. As it is, a powerful and special muscular effort can be made and modified in force and direction at pleasure, whilst the connection of the sensational with the organic nerves ensures that association between impression and secretion which is always required. Arrived at the back part of the mouth or nostrils, any irritating substance finds its natural mode of removal by ingurgitation, and then comes under the command of involuntary muscles. Here increased secretion may invariably be conjoined with muscular action, now that this is automatic, as well as with impressibility. The mucous surface, therefore, is now supplied by a ganglion, in which nerves for secretion are structurally connected with nerves for impressions and for muscular movement.

Besides the derangement of ganglionic action which would probably result from the occasional sudden and extreme excitement of a voluntary nerve, were such an one to be admitted into the spinal ganglion, we perceive in the arrangement of the organs of the senses another reason for its exclusion in all cases. Were the voluntary part of the *portio dura*, through which the defensive actions of the outworks are effected, to pass through the ganglion which governs the secretion of the surface, we should never be able to make a voluntary muscular effort without occasioning at the same instant increased secretion. Peering at an object would cause instant flow of tears, smelling be attended with nasal flux, and compression of the lips with flow of saliva. Such a combination *is* required when an external stimulus excites the movement, and is then effected through the connection between the impressional and the organic nerves in the spinal ganglion. It is *not* required when the stimulus is volitional, acts from within, and is avoided in consequence of the non-connection of the nerve of voluntary movement with the ganglion.

It is true that this same nerve of voluntary motion, the facial, is the source from which the sympathetic ganglia of the fifth chiefly derive their motor element. But we must assume that the contribution is in every instance made up of purely spinal, and, therefore, of involuntary fibres.

As in all probability certain filaments of the fifth supply the vascular tissue of the retina, so also are similar filaments furnished to the delicate and highly vascular membrane in the upper chambers of the nose, where the olfactory nerves are expanded. And as in the eye, so here also may the acuteness of the special sense sustain modification from any alteration in the vascular web, induced by the reaction of the fifth nerve upon the ganglia supplying this part. Thus, the inhalation of mild snuff might increase our appreciation of odours by stimulating the circulation in the membrane in which the terminations of the olfactory nerves are imbedded, whilst the greater stimulation of sharp snuff might obtund the sense of smell by the congestion of vessels it induced.

A mere odour, however powerful, will not affect the eye, except indirectly, when it produces faintness; but a *pungent* odour will occasion redness of eye and flow of tears, before the muscular effort of sneezing has happened to account for their occurrence. In the first instance, the stimulus is restricted in its influence to the special nerve of smell; but in the second, the fifth nerve also is irritated, and its peculiar ganglionic and cerebro-spinal reactions induced.

From the common origin and common gangliation of the sensational nerves of the interior of the eye and of the nostril, we can readily understand how very bright solar light may occasion sneezing, in consequence of excitement of the ocular branches of the fifth nerve, spreading at their centric termination to the nasal filaments, and there inducing the normal motor reaction on the respiratory nerves; and how persistent irritation of the nostril (as by a foreign body impacted in it) may disorder the circulation of the retina, and so cause amaurosis, precisely as injury of a cutaneous branch of the fifth has been known to do; and also, why sternutatories may not be without their use in stimulating nutritive action in the internal structures of the eye.

The Schneiderian membrane being constantly covered with secretion, and being partially open to view, affords a good test of ganglionic reaction. In health, pungent odours or irritating particles occasion increased redness and increased secretion. But when the fifth nerve is palsied, these effects do not ensue. The nostril on the affected side is drier than usual, and does not pour out its secretion on an irritant being applied.*

In some instances of anæsthesia of the fifth nerve, the nostrils are red, spongy, and apt to bleed on the slightest irritation,—illustrating active interference with nutrition through the gray nerves.

Were the outworks of any of the special senses subject, during health, to purely involuntary muscular movement, they would to that extent be removed from the control of the will. A result of which, a mere reference to convulsive diseases, will sufficiently point out the inconvenience. Yet these outworks could not have had their secretions directly connected with any motor nerves except involuntary ones. Therefore they have no such connexion at all; their organic processes are superintended by a spinal and not by a sympathetic ganglion. We conclude, with respect to the nostrils, that any increase of secretion which results from impressions, which occasion at the same time voluntary movements, has its centre of ganglionic action in the Gasserian ganglion; whilst that which is accompanied by automatic movement (as the swallowing of nasal mucus, deglutition, speech) has its centre in the spheno-palatine ganglion.

THE SALIVARY GANGLIA.

The submaxillary salivary gland is the only one which is usually described as possessing an especial ganglion. There are frequently found, however, a small ganglion proper to the sublingual gland, several small ganglia in the parotid, and a fusiform ganglion on the *portio dura* within the Fallopian canal, which I believe to belong to the salivary glands in general. On this account it may receive as a provisional name that of *ganglion salivare.*

Comparative Anatomy.—In fishes, with the single known exception of *lophius piscatorius*, in which a small lobulated gland is found in the branchial cavity, the large mucous follicles of the mouth and pharynx appear to replace the salivary glands. In the skate, Mr Swan indeed describes a small "almost transparent" ganglion attached to a branch of the fifth nerve, and placed under the skin of the lower jaw near the angle of the mouth, which he considers in some measure to correspond with the submaxillary ganglion in mammals; but this body may, with some probability, be viewed as analogous to the peculiar formations discovered by Savi on many of the cutaneous twigs of the trigeminus in the electric rays.

Birds and snakes have very large salivary glands, but not possessing any acute sense of taste in the forepart of the tongue, no particular association of the salivary secretion with the tongue is needed, and no salivary ganglia have been discovered. In them, the Gasserian ganglion appears to be the common centre of organic action for the salivary glands, as it is in man, although in him other special ganglia are superadded,—a proof of what has been previously advanced, that distinctness of ganglionic centre is not required because glands are largely developed, but because glands need functional connexion with other parts.

In all terrestrial mammalia the salivary glands exist in conjunction with more or less acute sense of taste; and in all that have been examined for the purpose, the special salivary ganglia exist. In CETACEA, with the exception of the dugong, which has a large parotid, salivary glands are not found. The submaxillary ganglion is comparatively larger both in carnivora and in ruminants than in other mammalia,—corresponding in this respect with the greater size of the submaxillary glands. For although, as a whole, the salivary glands are less developed in carnivora than in rodentia and some others, the submaxillary and sublingual glands are very large, the deficiency affecting only the parotid.

GANGLION SALIVARE.

Connections in Man.—Where the auricular branch of the vagus joins itself to the *portio dura* within the Fallopian canal, a small elongated oval bulging may be noticed on the outer aspect of the nerve. This swelling is found to contain gray nerve-cells interspersed amidst the white nerve-tubes. It does not involve all or even the greater part of the facial nerve, but that portion only with which the fibrils from the vagus intermix, and from which the *corda tympani* takes its rise. Nor do all the fibrils of the auricular branch of the vagus enter into this fusiform ganglion.

The *ramus auricularis* is a mixed nerve, containing filaments from the glosso-pharyngeal—both impressional and motor,—and from the vagus—impressional only. This is the reason why the contribution from the former nerve comes off from its second or symphathetic ganglion, thus gaining the motor element; whilst that from the latter comes off between the first and second ganglia, thereby deriving from it nothing more than impressional fibrils. (See Plate XI. Fig. 31.)* Arrived at the Fallopian canal, the *ramus auricularis* sends its filaments in three directions. A few cross the *portio dura* at right angles, and, without mixing with that nerve, supply the lining membrane of the *meatus auditorius*. Others join the *portio dura*, and entering its neurilem, direct themselves upwards. Of these filaments, some appear to enter the ganglion, others do not. The third set of filaments pass through the fusiform ganglion, and direct themselves downwards and outwards for distribution with the facial nerve.

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* Edin. Med. and Surg. Journal, Vol. lxviii. p. 267.

Proceeding from the ganglion is the *corda tympani.* This also is a mixed nerve.

Analysis.—Impressional Element. From the glosso-pharyngeal and vagus through the auricular branch: from the fifth nerve, retrograde filaments through the *corda tympani.*

Impressional Distribution.—To the parotid gland in company with motor fibrils from the facial; to the other salivary glands through the *corda tympani.*

Motor Element.—From the facial nerve, and from the motor portion of the glosso-pharyngeal.

Motor Distribution.—To the excretory ducts of the parotid gland.

Ganglionic Connection.—With the superior cervical ganglion either by gray filaments which ascend the Fallopian canal, having entered through the stylo-mastoid foramen, or by others which have been conveyed through the *ramus auricularis.*

Ganglionic Distribution.—To the parotid gland.

Use.—To associate the secretion of the parotid gland with impressions made on the tongue; with the state of the stomach and with that of the system at large. To connect together activity of secretion and motion of the excretory ducts.

GANGLIA PAROTICA.

Longet has found in the horse, and Andersch and Scarpa in the human subject, two or three small ganglia in the substance of the parotid gland, on the points of junction between the temporo-facial branches of the *portio dura* and the auriculo-temporal branches of the fifth nerve.

The *Analysis* assimilates these to the former.

Impressional Element.—From the fifth nerve direct: from the glosso-pharyngeal and vagus through the *ramus auricularis.*

Impressional Distribution.—To the parotid gland.

Motor Element.—From the facial nerve direct: from the glosso-pharyngeal through the *ramus auricularis.*

Motor Distribution.—To the radicles of Steno's duct.

Ganglionic Connection.—With the superior cervical ganglion through *nervi molles* which accompany the ascending branches of the external carotid.

Ganglionic Distribution.—To the parotid.

Use.—To associate the secretion of the parotid gland with impressions made on the tongue; with the state of the stomach, and with that of the system at large. To connect together activity of secretion and motion of the excretory ducts.

GANGLION SUBMAXILLARE.

Synon.—Glottic; first described by Meckel in 1748.

Connections in Man.—The submaxillary ganglion receives filaments from the gustatory branch of the fifth nerve, of which the greater portion evidently proceeds from the *corda tympani*, which has previously been bound up in the same sheath; some fibrils, however, appear to come from the fifth nerve itself. From the fore-part of the ganglion, filaments pass to the gustatory nerve, and entering into its sheath, course on in company with the portion of *corda tympani* which has not passed into the submaxillary ganglion, and together with this are probably destined for the sublingual gland. A lash of small nerves is furnished by the ganglion to the lobules of the submaxillary gland. Gray fibres from the superior cervical ganglion wind along the lingual and facial arteries, and some of these connect themselves to the submaxillary ganglion.

The *corda tympani* is a compound nerve, as proved by the occasional existence upon it of a fusiform ganglion.* (See Plate X. Fig. 29†). It is neither exclusively sensational and continued from the Vidian, as H. Cloquet supposed; nor exclusively motor and a mere branch of the facial, as many anatomists formerly considered. It consists of impressional filaments from the glosso-pharyngeal and vagus through the *ramus auricularis* of others, from the gustatory branch of the fifth—which pursue a retrograde course: and of motor filaments from the glosso-pharyngeal, and from the facial. The latter not being given off earlier, in order that they may join the other constituents from the *ramus auricularis*.

It is the opinion of Longet that sensational filaments from the gustatory nerve pursue a retrograde course along the *corda tympani* in order to be distributed with fibrils of the facial nerve, and he refers to this as explaining the partial sensibility manifested by the facial nerve immediately on its emergence from the stylo-mastoid foramen. This circumstance, it is true, might be otherwise explained by supposing that sensational filaments were furnished to the *portio dura* by the superior Vidian nerve. But as there does not appear to be any particular purpose to be fulfilled by connecting the ganglia to which the facial nerve contributes, with the supra-maxillary nerve, whilst there is manifest advantage in connecting them with the gustatory branch of the fifth, I adopt Longet's suggestion that the gustatory nerve sends retrograde filaments along the *corda tympani*, which, by entering into the *ganglion salivare*, associate the action of this with the taste of the fore-part of the tongue.

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* In the goat, Mr Swan found a distinct oval ganglion upon it, close to the tympanum. Op. Cit. p. 168.

† Vol. lxvii.

Analysis.—Impressional Element.—From the gustatory branch of the fifth nerve directly; from the glosso-pharyngeal and vagus through the *corda tympani.*

Impressional Distribution.—To the submaxillary gland.

Motor Element.—From the facial and the glosso-pharyngeal nerves, both through the *corda.*

Motor Distribution.—To Wharton's duct and its radicles.

Ganglionic Connection.—With the superior cervical ganglion through *nervi molles.*

Ganglionic Distribution.—To the gland.

Use.—To associate the secretion of the submaxillary gland with impressions made on the tongue; with the state of the stomach, and with that of the system at large. To connect together activity of secretion and motion of the excretory ducts.

GANGLION SUBLINGUALE.

A small ganglion has been found by Blandin in the sublingual gland. When present, its composition would probably be precisely similar to that of the preceding. The filaments of *corda tympani,* which pass on without entering the submaxillary ganglion, would convey the same constituent filaments to the sublingual ganglion; the gustatory nerve would supply the rest. When the ganglion is wanting, the lash of filaments which proceed from the submaxillary ganglion to the gustatory nerve, entering into its sheath, may be presumed to supply essentially the same kind of compound nerves to the sublingual as are furnished to the submaxillary gland.

The *Analysis.*—Substituting sublingual for submaxillary, will be precisely the same as the preceding.

Physiology and Pathology.—We have assumed that all the salivary ganglia have entering into them a contribution from three impressional nerves. The contribution from the fifth nerve is demonstrable in the case of the submaxillary ganglion; that from the glosso-pharyngeal and vagus is inferred. Now, the impressional filaments pass through the ganglion, and are lost in the gland. The gland itself is rarely the subject of direct impressions or sensations. The filaments cannot be directly affected by impressions made on the tongue, because they do not reach the surface of the tongue; nor can any influence be communicated to them by other impressional fibrils which do reach the surface of the tongue, except it have first reached the brain. Hence, although the same gustatory nerve which supplies the tongue supplies also the salivary gland, the influence of sapid substances on the tongue can only be communicated to the gland through the intervention of the brain. It can scarcely be otherwise than that the distribution is arranged for the express purpose of connecting the secretion of the gland with the functional exercise of the sentient nerve, and, if so, we must admit what we have assumed sensational reaction and centrifugal action.

Each of the salivary ganglia is also presumed to receive a contribution from two motor nerves. And it is somewhat remarkable that all the salivary glands derive the few motor filaments required for their ducts from the *portio dura*, and from the glosso-pharyngeal; although the proximity of the motor division of the fifth, and of the ninth nerve, would have rendered these an equally convenient source. In the exercise of its function the tongue is perpetually moving. But although due secretion and muscular action are both aids to the proper performance of its office, they could not be inseparably conjoined without inconvenience; for during the energetic action of the muscles of the jaw in mastication and speech, a direct association of salivary secretion with either or both of the two nerves of motion (5th and 9th) then in exercise, would have caused an increase of secretion as inconvenient at all times as we find even now, in rapid speaking, it frequently becomes. When we wish for a sudden supply of saliva, we make a sucking effort with the mouth; this is effected through that branch of the *portio dura* which supplies the buccinator. This suction acts mechanically in emptying the salivary ducts of their contents; but it probably does more. The contraction of the buccinator muscles is voluntary; but there may occur at the same instant an automatic action of a motor nerve which is quite involuntary,—just as the voluntary effort to invert the eye, and, to a less extent, to move it suddenly in any other direction, will cause simultaneous contraction of the pupil through the involuntary motor nerves of the iris. It may be assumed, then, that a similar effect is produced on those purely spinal filaments of the *portio dura* which pass through the salivary ganglia whenever the buccal muscles are called into active exercise. By connecting the increase of saliva with a motor nerve which is, if it may be so termed, the colleague of the fifth in guarding the senses, it is sufficiently but not unduly promoted, during eating and speaking, by the gentler movement of the buccal and labial muscles, over which the facial nerve presides. Moreover, by the salivary ganglion being responsive to the same impressional filaments which in the brain react most readily on the facial nerve, the ganglionic reaction is excited through the same two nerves which are so intimately associated in producing all the excito-motory actions which accompany the requirement for increased flow of saliva. Hence, by making the facial a source of the motor element to the salivary ganglion, the double stimulation of ganglionic cells is insured. When the contact of sapid bodies excites the gustatory branch of the fifth, the excitement which results from the motor reaction of this on the facial nerve extends its influence to the origin of those spinal filaments of the facial which pass through the salivary ganglia, and so stimulates the same ganglionic cells which are already, or rather which are simultaneously stimulated by the transmitted impressional filaments of the gustatory nerve.

When the impression is made on the base of the tongue, it comes within the sphere of another gustatory nerve—the glosso-pharyngeal.* The circle of nervous reactions are precisely similar, the impressional and motor portions of the glosso-pharyngeal taking the place of the fifth and of the facial nerves. The three reactions are again exemplified. Sensational reaction, in the spreading of gustatory excitement to the root of those filaments destined to pass to the various salivary glands through their respective ganglia. Motor reaction, in the ejaculatory motions of the salivary ducts which result. Ganglionic reaction, in the excitement of the salivary secretion.

When, from disorder in the stomach, nausea is induced with its concomitant salivary flow, the irritation of the gastric filaments of the vagus spreads to the rest, and through those which pass to the salivary ganglia excites the glands to increased action. The vagus makes its motor reaction very probably on the motor root of the glosso-pharyngeal. Dr Wright has proved by his very interesting experiments how intimate is the consent between the action of the salivary glands and the state of the stomach, as shown both by the quantity and the chemical properties of the saliva, under conditions which forbade the circulation to be the medium of connection. In one instance, when the contents of the stomach had acidified in consequence of the saliva being prevented from descending, the saliva became very alkaline. On correcting the acidity in the stomach by carbonate of soda, the saliva speedily became *less* alkaline. Had the alteration taken place through the medium of the blood, this result could hardly have occurred. The irritation of the stomach excited the salivary glands through the *par vagum;* as the gastric irritation lessened, the salivary over-action subsided.

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* Without discussing the question as to which is the nerve of taste, it may be remarked, that the balance of evidence is decidedly in favour of investing two nerves with that office. Taste, apart from smell, is not more widely different from touch, than is this from the sense of temperature, or of the desire for breath; nor than touch with a healthy surface from touch after abrasion of the cuticle. Man tastes with the tip of his tongue, to which the glosso-pharyngeal does not reach; here the fifth is a nerve of taste. Birds have the tongue unsupplied by the fifth nerve; here the glosso-pharyngeal must be a nerve of taste. Both are equally unlike the other nerves of special sense in the possession of a spinal ganglion.

The important part played by the saliva—oral and pancreatic—in converting starch into sugar in saccharine diabetes, invests with increased interest the medium of nervous connection between the salivary glands of the mouth and the salivary gland of the duodenum (pancreas).

Through the impressional filaments terminating in the salivary gland, and through each gland deriving its supply from the same sources, the utmost harmony of action is ensured. Deranged activity in one gland, by irritating the impressional nerves, causes reaction on the impressional nerves of all the other glands, and consequently induces a similar state of disorder in each. In health, therefore, the salivary glands are excited not singly but all at once. In active disease, all for the most part become affected together. Owing to the large number of the impressional filaments of the fifth nerve irritated when all the salivary glands are inflamed together, there cannot but be considerable excitement of the remainder of the fifth nerve, and in consequence of such excitement some modification of nutritive action in all the parts which derive impressional and organic nerves from this source. Hence, in active inflammations of the eye and ear, it becomes a question whether the excitement which always precedes mercurial ptyalism will not prove more injurious than the subsequent derivation and altered molecular action beneficial. Mercury rapidly given, always at some period of its administration causes general excitement, but this is usually accompanied by such a general alteration in the performance of nutrition, as is incompatible with inflammatory action. Hence, when the tissue inflamed is of such a nature that its office is not necessarily destroyed by the morbid process, the ultimate good compensates for any constitutional irritation set up by mercury in the meantime. But in the case of inflammation affecting the delicate organs of the senses in irritable subjects, as these organs are supplied in common with the salivary glands in which mercury excites a specific inflammation, we have the sensational reaction of the irritated fifth nerve superadded to the general excitement of the system. Accordingly, we find that mercury pushed to ptyalism is most serviceable in inflammations of the eye and ear, *after* we have reduced very active inflammation to a subacute form. Acute iritis is sometimes observed to be made worse as mercurial ptyalism sets in, improving subsequently as the glandular irritation subsides. So also in the iritis which has come on in a syphilitic case, whilst the patient was under the *full* influence of mercury, *milder* mercurial treatment with sedatives has proved the most efficacious treatment.

Flow of saliva is produced by mere friction of the tongue, but to a far greater extent if nausea be superadded. The idea of gratifying the palate will cause the mouth to water. A thought which gives rise to the feeling of nausea will do the same. These facts appear to point to excentric action of the impressional nerves, and also to afford some clue to the reason why emotion exerts a more considerable influence than an impression. By the impression on a given point of surface a few impressional filaments only are stimulated, and the ganglionic reaction induced is but slight and comparatively tardy in its occurrence; but when emotion operates, it calls forth the entire influence of all the related nerves together; and the nervous reaction in the ganglia, as in the other centres, is as great as possible.

The mucous glands of the tongue receive filaments from the fifth nerve, by which they are brought into harmony with the other mucous tissues in the vicinity; from the glosso-pharyngeal, by which they are related to the tonsils and pharynx; from the vagus, by which they are intimately connected with the state of the stomach, and thoracic and abdominal viscera; and from the superior cervical ganglion, by which they are similarly associated with the condition of the system at large.

The labial glands, cheeks, tonsils, gums, and teeth, derive their organic nerves direct from the Gasserian ganglion, being connected with the sympathetic through the filaments which join the fifth nerve, or which accompany the arteries. Their organic actions not having (with the exception of the cheeks) any direct connection with muscular movement, do not require more than a spinal ganglion for their superintendence. As the tonsils derive some additional filaments from the glosso-pharyngeal, their secretion is probably increased just when it is most required for the purpose of aiding in deglutition.

By the teeth-pulps and the gums being supplied with filaments of the same impressional nerve, we explain the constant extension of irritation from a carious tooth to the gum, or from the gum to a sound tooth. The preservative power of dentrifices and friction may in part be owing to the healthy tone induced in the gum, being imparted through the impressional nerves to the gray filaments of the pulps of the teeth. The destructive effect on the teeth of ulceration of the gums, and of frequent mechanical irritation, may in like manner be understood.

A carious tooth is a complete neurometer for nervous reactions. Sensational reaction is exemplified in the earach, which so commonly accompanies severe toothach, and in the occurrence of toothach from the application of cold to the skin, and from gastric disorder. Motor reaction, by the convulsive twitchings of the facial and maxillary muscles when the pain is severe. Ganglionic reaction, by languid inflammation in related parts, as in the alveolar membrane, cheek, tonsil, or pharynx.

It sometimes happens in the anguish of toothach, that ocular spectra and acoustic illusions occur. These admit of a twofold explanation. (1.) The sensational centre may have become so highly excited by the extreme pain, that it exaggerates ordinary impressions into morbid perceptions. (2.) The filaments of the fifth nerve, which proceed to the eye and to the internal ear, may be so excited (by sensational reaction) as to affect the sympathetic ganglia of these two organs, and so disorder the vascular actions going on at the peripheral expansions of the optic and auditory nerves to the extent of deranging their function. The first would be merely sensational reaction, the latter both sensational and ganglionic.

We conclude that the mucous membrane of the mouth and fauces derives its organic nerves from either the spinal or the sympathetic ganglia of the fifth nerve indifferently, according as the secretion of the given part is or is not associated with involuntary muscular movement. So far as the mere secretion of mucus is concerned, either kind of ganglion appears to be sufficient. The moisture of the lips and the mucous secretion of the greater part of the tongue are superintended by the Gasserian ganglion. The mucous membrane of the fauces has its secretion associated with the involuntary action of the faucial muscles, and therefore derives its organic nerves from the sympathetic ganglia, with which the muscular nerves are connected, viz., the spheno-palatine ganglion, the second ganglion of the glosso-pharyngeal, the second ganglion of the vagus, and the superior cervical ganglion. The mucous membrane supplied with filaments by the glosso-pharyngeal nerve and the vagus, which is not under the dominion of involuntary muscles, receives organic fibres from the primary or spinal ganglia of these nerves, just as the fore part of the mouth does from the Gasserian. The glands with regular excretory ducts which are connected with the mouth have their organic centre in all cases in distinct and special sympathetic ganglia, because the association of their action with involuntary motion is invariably necessary for the purpose of excretion.

Holmes Chapel, Cheshire,
March 27th, 1848.

ART. II.—*Report of the Medical Cases treated in the Liverpool Northern Hospital during* 1846 *and* 1847. By JAMES TURNBULL, M. D., Physician to the Hospital.

A WANT of hospital accommodation having been much felt in the neighbourhood of the docks and manufactories of the north end of Liverpool, two large houses were converted into an hospital, and opened in 1834, to receive the severe accident cases which are constantly occurring in that populous part of the town, and also acute and urgent medical cases. A building, capable of containing about 170 beds, was subsequently erected near the other, and was opened in October 1845 with 105 beds. The demands upon the institution have since then increased so much, especially in the medical department, that an addition is now being made to this number, having become absolutely necessary, in order that the patients might be allowed to remain in the hospital a sufficient length of time for perfect recovery. This need for increased accommodation will continue to be felt as the docks at the north end of the town are completed.

The building is in the Elizabethan style of architecture, and the wards are numerous and small, each containing only ten or twelve beds. The arrangements as regards bath-rooms, water-closets, and apartments for nurses, are very convenient, but the windows are smaller and more numerous than necessary, being made to suit the style of architecture.

Though the institution has now assumed the character of a general hospital, the surgical cases are still chiefly accidents, and the medical are many of them acute or urgent cases of disease. Their severity arises from the hospital being situated near to the most densely populated and unhealthy parts of the town, and close to the docks and shipping, and also from the medical officers, in consequence of the limited accommodation, having been able to give admission only to the most urgent cases, and to those likely to remain but a short time in the institution.

The number of patients treated at the hospital in 1846 was 2503, of whom 956 were labourers, 703 sailors, 239 mechanics, 397 women, and 208 children. Of these, 471 belonged to Liverpool, 587 to different parts of England, 874 to Ireland, 143 to Scotland, 111 to Wales, and 317 were foreigners. This shows that less than one-half of our patients are English, and that a large proportion belong to Ireland and foreign parts. As many as 703 were sailors, a considerable number of whom were American seamen, sent by the consul, who pays to the funds of the hospital 12s. a week for each man. Persons of colour from America and the coast of Africa, and some of the Malay race, are admitted. In general, I find it more difficult to treat patients belonging to these dark races than the natives of this country, and they are more liable to suffer from relapses.

The following table shows the number of medical and surgical cases, and of out-patients treated in the hospital in 1846 and 1847:—

	1846.	1847.	Increase.
Medical cases,	731	760	29
Surgical cases,	889	926	37
Out-patients,	789	794	5
Remaining from previous year,	94	99	5
Total,	2503	2579	76

The total number of patients treated in the hospital from the 1st of January 1846 to the 31st of December, including those remaining from the preceding year, but excluding the out-patients, was 1714, and, in 1847, the number was 1785. The cost of each patient would appear to have been L. 1, 11s. 10d., and, if the out-patients were included, it would be still lower; but, as they are all slight surgical cases, requiring little or no medicine, the expense of treating them is but trifling. This being below the average cost, not only of eight English provincial hospitals, where the expense is L.2, but also of eight[*] Scottish hospitals, where it is L.1, 16s. 3d., it must be evident that the funds are expended with strict regard to economy. In estimating the average cost, however, we must take into account the average duration of the treatment of each patient, and this is considerably shorter in the Northern than in most other hospitals, being only about twenty days. From Dr Orr's statistics,[†] it would appear, that, in the Royal Infirmary of Glasgow, the average residence of the patients was, in 1846, longer, being 28½ days, and yet the expense was rather less, being on an average L.1, 10s. 4¾d. for each patient.

When we take into consideration the severity of the cases admitted into the hospital, surgical as well as medical, owing to its proximity to the docks and shipping, from which patients are often landed in an advanced stage of such diseases as dysentery, scurvy, and consumption, without having had any previous treatment,—when we consider the limited accommodation permitting the admission of the worst cases only,—and when we take into account the notoriety which Liverpool has acquired of being the most unhealthy town in England, as much, however, I believe, from its position favouring immigration from Ireland, as from any local causes, we would naturally expect to find the rate of mortality higher in this than in most other hospitals. It does not, however, seem to be affected by these agencies to any very considerable extent, or at least so much as to bear an unfavourable comparison with most other institutions.

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[*] Dr Walker on the Statistics and Mortality of the Hospitals of Scotland. Edin. Med. and Surg. Journal, Vol. lxxii. April 1847.

[†] Edin. Med. and Surg. Journal, Vol. lxvii. April 1847.

In 1846, the mortality among the patients treated in the Northern Hospital, excluding the out patients, was 1 in 12. In the medical cases, it was 1 in 9.7. During last year, there were 149 deaths, or 1 in 11.9. 76 of these occurred among the medical cases; two of them, however, were dead when brought, viz., a case of immersion, and one of hæmoptysis; and two others, cases of pneumonia, survived only till the following day. Excluding the two first, the mortality in the medical cases was 1 in 10¼. The mortality of the whole cases was less than that of the Edinburgh Royal Infirmary in the year 1844–45, which was 1 in 8.8, and less also than that of the Glasgow Infirmary in 1845, which was 1 in 10½. It differed but slightly from the mortality of the Birmingham and Manchester hospitals in 1842,—that of the first being 8.64 per cent., and that of the second 8.12 per cent.

I have no means of comparing the mortality of the medical cases in the Northern Hospital with that of any of these hospitals, except the Glasgow Infirmary. In the Northern Hospital it was in 1846, 1 in 9.7, and in 1847, 1 in 10.27; but in the Glasgow Infirmary it was in 1845, 1 in 7.2, and in 1846, as high as 1 in 6.4. The mortality of the surgical cases treated in the Northern Hospital was in 1846, 1 in 15, and in 1847, 1 in 12.68. The higher rate in the latter year was probably caused by the occurrence of hospital gangrene.

The following table exhibits a comparative view of the number of cases of each disease and class of disease in 1846 and 1847, and also of the number of deaths:—

DISEASES.	No. of cases in 1846.	Died.	No. of cases in 1847.	Died.
Febrile diseases.				
Fever, simple and typhoid,	30	1	31	2
Ague, ...	29	...	40	...
	59	1	71	2
Rheumatic affections.				
Acute rheumatism, .	12	2	23	...
Subacute & chronic rheumatism,	122	1	122	1
Capsular rheumatism, .	1	...	5	...
Sciatica, ...	6	...	2	...
Neuralgia and pleurodiny, .	8	...	3	...
	149	3	155	1

DISEASES.	No. of cases in 1846.	Died.	No. of cases in 1847.	Died.
Diseases of the nervous system.				
Apoplexy,	4	3	6	2
Paralysis,	12	1	15	...
Headach,	3	...	5	...
Hysteria,	12	...	4	...
Epilepsy,	10	...	9	1
Chorea,	1	...	1	...
Tetanus,	1	1	...	...
Mania,	2	...	...	...
Delirium tremens,	10	...	12	2
Debility,	5	...	16	1
	60	5	68	6
Respiratory organs.				
Laryngitis, chronic,	2	...	2	...
Quinsy,	4	...	6	...
Subacute and chronic bronchitis and influenza,	89	5	90	5
Acute bronchitis,	7	4	9	4
Inflammation of lungs,	5	1	17	8
Pleurisy,	7	...	11	1
Pleuritic contraction, &c.	1	1	...	...
Asthma,	...	...	4	...
Hæmoptysis,	9	1	5	3
Pulmonary consumption,	28	17	28	15
	152	29	172	36
Organs of circulation and the blood.				
Disease of the heart,	11	5	12	5
Aneurism of the aorta,	...	...	1	...
Anæmia,	4	...	5	...
Sea scurvy,	14	2	13	3
Land scurvy,	...	...	17	1
Purpura hæmorrhagica,	1	1	...	...
	30	8	48	9
Stomach and intestinal canal.				
Ulcerated pharynx,	1	1	...	...
Dyspepsia and constipation,	25	...	22	...
Perforation of stomach,	1	1	...	...
Hæmatemesis,	3	...	2	...
British Cholera,	8	...	...	...
Diarrhœa,	56	6	11	1
Dysentery,	49	10	63	9
Peritonitis,	2	2	...	...
Colic,	8	...	...	...
Enteritis,	1	1	...	...
	154	21	98	10
Jaundice,	7	1	5	1
Disease of liver,	14	1	4	3
Ascites,	7	1	5	1
General dropsy,	26	4	17	2
Diseases of urinary organs,	5	...	6	...

DISEASES.	No. of cases in 1846.	Died.	No. of cases in 1847.	Died.
Irregular menstruation,	10	...	14	...
Ovarian dropsy,	...	...	1	...
Ovarian abscess,	...	...	1	1
Erysipelas and skin diseases,	17	...	20	...
Diseases of eye and ear,	4	...	8	...
Syphilis,	22	...	30	...
Inanition,	1	...	1	1
Immersion,	4	...	25	2
Intoxication,	6	1	4	...
Poisoning,	1	1	3	...
Not named,	2	...	5	2
Total,	731	77	760	76

I.—FEBRILE DISEASES.

A considerable number of cases of simple fever are treated in the hospital, but infectious typhoid fever is excluded; and when cases do obtain admission, they are usually transferred to the fever hospital. In the spring of 1846, typhus broke out in one of the wards and attacked several convalescent patients, and two nurses, and one of the house-surgeons. During last year, when fever was excessively prevalent in this town, and when daily applications for admission were made by fever patients, it was impossible to avoid admitting some cases; but I am not aware of more than one instance in which it spread to any one connected with the hospital.

There is, perhaps, no provincial town in England better supplied than Liverpool with hospitals, dispensaries, and other charitable institutions, and yet there is, perhaps, none that stands more in need of a fever hospital. There are no fever wards connected with the Infirmary, or the Northern or Southern Hospitals, so that when cases of fever occur in any of these institutions, they must be sent to the only fever hospital in the town, which is a small building connected with the work-house, and not supported, as these institutions are, by voluntary contributions, but under the management of the parish authorities. The class of persons who are just above the grade of paupers, are thus in a great measure deprived of the assistance of an hospital when attacked with a disease in which the advantages of hospital treatment are most obvious. It appears to me, therefore, that fever wards in connection with some of the existing institutions, or an hospital supported by voluntary subscriptions, are much needed; and, the lowest class being already provided for, that such an institution in a town like this, with many strangers and persons residing in lodgings, would be still more serviceable, if it could be made in whole or in part self-supporting, so that, by paying a moderate sum weekly, any one might obtain a superior kind of accommodation.

Ague.—The majority of the patients who are admitted with intermittent fever, come from America and the coast of Africa; and it would seem that, after having recovered from this disease, they are liable to have a return of it on coming into colder latitudes. The fact of 29 cases having occurred in 1846, and 40 in 1847, without any having proved fatal, shows that the disease is not usually severe; and, in general, I find that it is speedily cured by quinine, in the dose of two or three grains thrice a day, along with aperients.

Of the following cases, the two first were such as are usually met with in this hospital, and show the ordinary treatment adopted. The third was a more than usually obstinate case, being complicated with congestion of the liver and acute bronchitis; and in the fourth, there was jaundice and great enlargement of the spleen.

Case 1. *Quotidian Ague.*—A sailor lad, aged 16, was admitted on the 9th November 1846, with ague, which had attacked him three months previous, when at New Orleans. He went into an hospital there, and soon got well, but it returned a week after he went to sea, in consequence of getting wet. The fit came on daily about two o'clock, and at first it lasted only half an hour, but it now continues an hour and a half. When admitted, he was beginning to come out of the cold stage. He still shivered, but his skin was becoming warm. His tongue was whitish, but red at the edges. The pulse was 112, contracted.

A stimulating diaphoretic draught, consisting of sesquicarbonate of ammonia, five grains; liquor of acetate of ammonia, two drachms; spirit of nitrous ether, one drachm; camphor mixture, five drachms, was directed to be taken immediately.

Two grains of disulphate of quinine three times daily were prescribed. A pill, consisting of three grains of compound extract of colocynth and two grains of blue pill, was ordered at the hour of rest, to be followed in the morning by the senna draught.

The patient continued to take the quinine during nine days that he remained in the hospital. He had no return of the ague, and went out much improved in appearance and strength.

Case 2. *Tertian ague producing great anæmia.*—D. Hegan, a sailor, aged 22, was admitted on the same day as the first patient. He was attacked with ague on his passage from Mobile to New York three months before. He went into an hospital there, and recovered, but the disease returned twelve days before his admission here. He has a paroxysm every second day, and yesterday it came on at two o'clock and lasted till nine, the cold stage continuing two hours. Three months ago the patient had a good florid colour, but he has now the pale puffy appearance which we see in the advanced stage of chlorosis; but he does not seem to have become much thinner. With the stethoscope a loud continuous murmur is heard in the veins of the neck. Tongue pale and tremulous. Bowels regular, and pulse natural.

The same treatment was adopted in this as in the preceding case, except that the diaphoretic was not required. The patient took a double dose of quinine before the usual time of the next paroxysm, and he had no further attack after being in the hospital. One grain of the sulphate of iron was added to each dose of quinine mixture, to assist in restoring the red particles of the blood. The patient, however, finding himself cured of ague, would not continue the treatment a sufficient length of time for this purpose, and left the hospital on the 18th, still pale, though much improved in appearance.

Case 3. *Tertian ague with congestion of the liver and acute bronchitis.*—A German sailor from Bremen, aged 33, was admitted on the 17th December 1847. He had an attack of ague at New York in August, and after leaving him, it again seized him fourteen days before arriving in this port. On admission he was very pale, and had considerable fulness in the region of the liver. He was treated with two grain doses of quinine thrice a day, and with blue pill and colocynth at night, and house medicine in the morning.

20*th.* He has had a fit of ague, which came on at seven this morning, and lasted till twelve. He is still in the sweating stage.

22*d.* He is now in the hot stage. Face flushed; skin very hot; pulse 134. There is pain at the epigastrium, and in the region of the liver on pressure. He has cough, and there are slight sibilant and mucous rattles at the lower part of the lungs posteriorly. He was ordered to take immediately four grains of calomel, and six grains of antimonial powder. House medicine to be taken four hours after the powder.

24*th.* He has cough and tightness of the chest, with expectoration of glairy mucus. Sonorous and sibilant rales are audible over every part of the chest. Tongue furred; thirst; and no appetite. Pulse 96.

One ounce of a mixture containing the following ingredients was ordered to be taken every fourth hour:—Ipecacuan wine, two drachms; liquor of acetate of ammonia, one ounce and a half; spirit of nitrous ether, four drachms; compound tincture of camphor, six drachms; peppermint water, five ounces.

27*th.* Cough less troublesome, and expectoration freer. Less sibilant and more mucous rattle. There is still much tenderness in the region of the liver. Eight leeches to be applied to the part. A teaspoonful of an expectorant mixture, with equal parts of oxymel of squill and compound tincture of camphor, to be taken occasionally, and at bedtime a powder with two grains of calomel and two drachms of compound powder of jalap.

29th. The pain at the epigastrium was relieved by the bleeding from the leeches, and the patient felt better yesterday; but last night the symptoms of ague returned, and he had a severe fit lasting twelve hours. The skin is still rather hot, and the pulse 100.

30th. He is better; skin cool; pulse 96; still some cough. A blister was directed to be applied to the epigastrium, and four grains of sulphate of quinine to be taken thrice a-day in solution with dilute sulphuric acid.

On the 1st of January he had a short paroxysm, lasting five hours. From that time he recovered, the cough left him, and he had no return of ague during the succeeding twelve days, while he continued in the hospital and took quinine.

Case 4. *Tertian ague, jaundice, and enlargement of the spleen.*—R. Stanley, an American sailor, 28 years of age, was admitted on the 15th December 1846. He had just returned from the coast of Africa, and about fifty days before, a short time after leaving the coast, he was attacked with fever. He has now tertian ague, the cold stage of which comes on in the evening and lasts about half an hour. He is thin, and has a peculiar dark greenish-yellow colour. The pulse is 94; rather weak; tongue quite clean; bowels open; and motions of a light brown colour; there is no enlargement or tenderness of the liver, but the spleen can be distinctly felt, greatly increased in size; he has some shooting pain in the lower part of the belly, but none in the situation of the spleen.

The following medicines were ordered:—Every second evening two pills, consisting of five grains of blue pill, three grains of compound extract of colocynth, and two grains of extract of hyoscyamus; to be followed next morning by a draught of infusion of senna. Sixteen grains of disulphate of quinine were dissolved in eight ounces of water, acidulated by half a drachm of dilute sulphuric acid; and of this mixture the patient was directed to take one ounce three times daily.

24th. The jaundice has disappeared, and he has had no return of ague since he commenced this treatment, but the spleen is still very large.

27th. There seems to be some diminution of the size of the spleen. The patient feels quite well.

The pills were given up, and he was directed to take, three times daily, one ounce of a mixture consisting of eight ounces of compound decoction of sarza, and two drachms of the iodide of potassium. A drachm of mercurial liniment to be rubbed upon the part every night. As the patient did not feel anything the matter with him, he would not continue the treatment, and went out on the 30th December.

28th January. Readmitted.—The spleen feels almost as large and distinct as when he first came in. He has a very sallow complexion, and is thin. He complains more of the same shooting pain in the lower part of the belly, and has some shortness of breath. Tongue clean; appetite pretty good.

The patient was ordered to take, three times daily, one ounce of decoction of cinchona, containing five grains of iodide of potassium.

7th Feb. There seems to be little change. A small portion of mercurial ointment to be rubbed over the spleen once a day.

11th. The enlargement is decidedly less.

14th. The gums have become affected rather severely, though this was not intended.

23d. The mouth is almost well. The enlargement has diminished very greatly. His colour is less sallow; he feels better; has no shortness of breath; and is almost free from the pain at the lower part of the belly.

On the 29th he was dismissed cured.

Remarks.—The employment of deobstruent purgatives, with the preparations of iron and other tonics, has been recommended in the treatment of this disease by those who have experience in tropical diseases; and mercury, when given to any considerable extent, has almost always been found injurious. In this case, the jaundice and sallow complexion indicated a torpid state of the liver, in addition to the enlargement of the spleen, and the mercurial ointment and liniment were used as local stimulants, and not with the intention of affecting the system. After this a decided improvement, however, took place in the general health of the patient, and the enlargement of the spleen diminished.

II.—RHEUMATIC AFFECTIONS WITH AND WITHOUT ENDOCARDITIS.

On referring to the table, it will be found that this forms a very numerous class of diseases, 149 cases having occurred in 1846, and 155 in 1847.

Rheumatic fever—Two cases of acute rheumatism died in the hospital in 1846. The patients were both, however, admitted after having been long ill, and had at the time sloughs upon the back. In both cases the acute rheumatic affection was removed by the treatment adopted, but the patients being debilitated subjects sunk, from the exhaustion produced by the sores. There was a third case admitted, with a slough, that recovered. The patient was a stout sailor, who, being attacked at sea, had no treatment until brought from the ship to the hospital. The rheumatic affection speedily yielded to ordinary treatment; but recovery was long doubtful, from the exhaustion produced by the separation of a large slough which exposed the muscles and tendons round the sacrum.

In treating acute rheumatism, the first point which I take into consideration is, whether the patient will bear bloodletting from the system or not; and in all cases where the constitution of the patient is of ordinary strength, and the febrile disturbance considerable, with full pulse, and much redness, pain and swelling of the joints, I do not hesitate to direct that twelve or sixteen ounces of blood should be taken from the arm. This prepares the system to receive the full benefit of the medicinal part of the treatment, which is often quite inefficacious until vascular action has been reduced by depletion. When the first bleeding is followed up by other treatment, I seldom find it necessary to repeat it a second or third time, and when the patient is of weak constitution or anæmic, or when the febrile disturbance is moderate, general depletion is neither necessary nor beneficial. After bleeding, I give from five to ten grains of calomel with a grain or a grain and a half of opium, and next morning a purgative draught, with infusion of senna, Epsom salts, calcined magnesia, and half a drachm of the tincture of colchicum. This is repeated every day or every second day, according to the effect produced, until three or four doses have been taken. Twenty or thirty minims of colchicum are also given with carbonate of soda or magnesia twice or thrice a day, not, however, with the view of purging the patient, that effect being insured by the other means, but for the purpose of neutralizing and expelling by the kidneys the acid secretions generated in the system in rheumatism as well as gout. Besides using opium with the view of controlling the action of calomel, I also give it in the form of pill containing one grain, and repeat it twice, thrice, or four times in the twenty-four hours, whenever the severity of the pain or the want of sleep are such as to indicate the employment of this remedy. Patients are not unfrequently brought to us having the disease in a subacute form, the pain being very harassing, and yet the constitutional disturbance but trifling. In some instances too the disease passes into this subacute form after active antiphlogistic treatment has been adopted. In such cases I give opium in the manner described, and purge the patient moderately.

When all acute symptoms have subsided, I occasionally prescribe quinine; but I prefer the iodide of potassium in compound decoction of sarsaparilla or infusion of gentian, with occasional warm baths.

The three great remedies employed by almost all medical men of experience in the treatment of acute rheumatism will be found to be bloodletting, calomel as a purgative, and opium; and the chief differences in their methods of treatment consist in the extent to which they use each of them, and the precision with which they combine them so as to adapt them to individual cases, and thus attain their object of cutting short the disease. The plan of treatment already described, with the success of which I have every reason to be satisfied, differs from that recommended by Dr Macleod, chiefly in the more moderate extent in which blood-letting is practised. He observes, that, "in well-marked cases of rheumatic fever, within the first week of their onset, and in individuals of the average degree of robustness, from twelve to twenty ounces of blood may be abstracted with advantage, several successive times in the course of five or six days." It more closely resembles the method of treatment recommended by Dr Latham, who, while he has observed, that, by one of these methods singly, we may, in some cases, treat acute rheumatism successfully, recommends a compound of all the three, as safer and more successful. "I believe," he says, "that, in the treatment of this disease, and in the same cases, by the judicious use of opium, you may spare blood, and by the judicious use of bleeding, you may spare opium; that by calomel and purgatives properly administered, you may make bleeding and opium less needful, and that by bleeding and opium discreetly employed, you may leave less to be effected by calomel and purgatives."

Endocarditis.—This complication has occurred in at least one-half of the well-marked cases of acute rheumatism which have come under my care; but during the two years I did not meet in hospital practice with a single case of pericarditis in connection with rheumatism. Whenever any inflammation of the valves of the heart has been discovered, the preceding method of treatment has been modified, and, in addition to general bleeding, local depletion by cupping or leeches has been practised, and two grains of calomel with half a grain of opium have been given. Where calomel has been prescribed at an early period in large doses as a purgative, I am disposed to think that local depletion is of almost as much importance as the constitutional effect of mercury; for I have seen several instances in which the system could not be brought under the influence of mercury, and yet where the signs of valvular inflammation entirely ceased, the thickening of the valves appearing to subside along with the inflammation of the joints under the same treatment, and as one of many parts affected by a disease which pervades the whole system, but becomes located in certain parts only, of fibro-serous structure.

It has appeared to me that the small doses of calomel with opium often exercise as beneficial an effect upon the rheumatic affection of the joints as upon the cardiac complication, when the calomel is laid aside immediately upon the system becoming affected. The continued action of mercury upon the system has, however, seemed to me to prolong the disease in a subacute or chronic form in some cases; and my experience coincides, therefore, with that of Dr Macleod, who states that, at one time, he was always in the habit of giving calomel with opium, but that he repeatedly observed, that the rheumatism continued, although the mouth was affected, while it speedily subsided on continuing the narcotic and purgatives without the mercurial. Some have recommended the continuance of the mercurial action for a much longer period than I consider to be either necessary or expedient. Dr Hope speaks of its employment for three, four, five, or six weeks. I can scarcely, however, think that a valvular murmur, which persists after the mouth has been sore for a fortnight or three weeks, will be more likely to be removed by a prolonged continuance of this debilitating sorbifacient, than by the natural absorbent powers of the constitution. In deciding in any case with valvular murmur, whether we should bring the patient under mercurial influence, or continue it for a length of time, we should first know if the patient has had any previous attack of acute rheumatism, and should take into consideration every circumstance which can lead us to form an opinion as to whether the murmur proceeds from recent endocarditis, or from old valvular disease. Dr Taylor's able exposition of the causes of pericarditis and endocarditis, would seem to show that old valvular disease has been not unfrequently mistaken for recent endocarditis.*

The following cases will illustrate most of the preceding observations. The two first seemed free from complication.

Case 1. *Acute Rheumatism.*—A coach-builder named Austin, was admitted on the 15th June 1846, with pains in all his joints, brought on by sleeping in the open air. A warm-bath was given to him, and at bedtime a pill with five grains of calomel and one grain of opium. This was followed next morning by a draught with two ounces of house medicine (infusion of senna and Epsom salts) and half a drachm of tincture of colchicum. The following day the bowels were freely opened, but the pulse was 100. The left wrist was much swollen, and the pains were so severe that the patient could scarcely move himself. The same pill and draught were repeated as before. On the 17th he had not slept. The wrist was still swollen, and he could hardly move from pain. One grain of opium was given twice a day, and a draught thrice daily, containing fifteen minims of tincture of colchicum, and ten grains of sesquicarbonate of soda in one ounce of peppermint water.

* Medico-Chirurg. Trans., Vol. xxviii.

On the 19th he felt better, and the pill with calomel and opium was again repeated, and followed by the purgative draught. On the 22d the patient was convalescent, and had suffered no pain since the previous day. The bowels had been freely opened, the pulse was natural, and the tongue clean. On the 24th, as he had some pain in one shoulder, I gave him four grains of the iodide of potassium in peppermint water thrice a day. On the 27th of June he left the hospital quite well.

Case 2. *Acute Rheumatism.*—A groom, 36 years of age, not of very robust constitution, was admitted on the 5th October, having had pains in the limbs for three weeks, and for four days swelling of several of the joints. One knee and both feet and ankles were swelled, and the right ankle was much inflamed. He had pain also in the shoulders. There was thirst and considerable heat of skin, but the tongue was not much furred. The pulse was 106, rather full. There was no pain, palpitation, or abnormal sound at the heart. Twelve ounces of blood were taken from the arm with relief, and he passed a comfortable night after taking a pill with one grain of opium and six of calomel. The bowels were not, however, opened until the purgative draught with senna and colchicum had been repeated. The next day there was little change in the symptoms, and eight grains of calomel with one of opium were ordered at bedtime, and a purgative draught the following morning. On the 7th he was free from pain, and the pulse had fallen to 86. He had been very much purged. A draught containing twenty minims of colchicum and ten of tincture of opium, was given three times a day. On the 8th he continued better, and the pulse was 92. On the 9th there was considerable swelling of the right ankle, for which six leeches were applied. There was still some swelling of both ankles on the 12th, and the bowels being costive, three grains of calomel were given and followed by an aperient draught. Some thickening of the ankles remained after this, though the tongue was clean and the appetite good. On the 19th five grains of the iodide of potassium were ordered to be taken in compound decoction of sarsaparilla thrice a day, and on the 24th he had a warm-bath and an aperient. Under this treatment the swelling of the ankles and stiffness left him, and he finally gained strength and colour by taking syrup of iodide of iron. On the 10th of November he was dismissed cured.

Case 3. *Acute Rheumatism with Endocarditis treated by general and local bleeding, calomel, and the free use of opium; recovery perfect.*—J. Nickerson, a stout American seaman, 26 years of age, was admitted, 2d February 1847, having been ill two days with pain in the ankles, and a fortnight with cold in the head and chest. Ten years before he had been treated in the Northern Hospital for acute rheumatism, and had been bled.

Ankles both swelled, with slight redness on the inside of the left. He suffers extreme pain when he moves, or when they are touched. He has cough and some tightness of the chest, with slight sibilant rattle. Sounds of the heart natural. Pulse 86, sharp but not full. Tongue but little furred. Bowels not open. The patient was ordered to undergo venesection to twelve ounces, and to take ten grains of Dover's powder immediately after the bleeding. The patient was further to take at the hour of rest eight grains of calomel and one grain of opium; and next morning a draught containing three ounces of compound mixture of senna, one scruple of calcined magnesia, and half-a-drachm of tincture of meadow-saffron. He was ordered to take three times daily one ounce of a mixture consisting of three drachms of meadow-saffron, one drachm and a half of sesquicarbonate of soda, and eight ounces of peppermint-water.

4th. He complains excessively of pain, and has a very anxious expression. Has been well purged. Blood only slightly buffed; tongue coated, but not thickly; thirst moderate; skin not very hot; pulse not full, but resisting. He has a "leaping" sensation at the heart. The impulse is increased, and occasionally one pulsation is stronger than the others. Sometimes one contraction follows another too quickly, producing an irregularity of rhythm scarcely perceptible to the finger at the wrist, but very distinguishable with the stethoscope.

To be cupped to eight ounces.

The patient was directed to have every fourth hour a pill consisting of two grains of calomel and half-a-grain of opium; and the meadow-saffron mixture to be continued.

5th. The pain is less severe, and he feels better. The oppression of the chest was entirely removed by the cupping, and there is not now any irregularity of the heart's action or murmur, but the first sound is rather rough. Pulse 82. The pills gave him relief, and he slept well last night. The pills and mixture to be continued.

6th. The patient still suffers much pain, which is now chiefly in the shoulders and arms. He has had scarcely any sleep, and perspires profusely. The gums seem slightly affected. There is no palpitation, or any abnormal sound at the heart, but the countenance has an anxious expression. Bowels not very open.

One grain of opium was ordered to be taken every fourth hour instead of the calomel and opium, the senna draught to be repeated, and the colchicum mixture continued.

7th. He still complains of great pain, the opium by some mistake not having been given.

8th. He has felt relieved by taking the opium, and still perspires profusely. Tongue rather more furred; much thirst; gums but slightly affected; pulse 80. The impulse of the heart is increased in force, and the action is very irregular. There is also a bellows murmur over the aortic valves with the first sound.

Eight leeches were ordered to be applied over the region of the heart, and one grain of calomel to be taken with each grain of opium. To have afterwards one ounce of castor-oil.

9th. The pulse is still irregular, but in other respects he is better.

10th. The gums are now decidedly affected. The pulse is 72, and there is no murmur. The calomel and opium to be laid aside, but the colchicum mixture continued.

11th. Still pain and stiffness of the joints on motion, but the tongue is clean, and the pulse 76, regular. There is no murmur at the heart. He slept very badly. Two grains of opium to be taken at bed-time.

From this time he got rapidly better. On the 13th the colchicum mixture was stopped, and three grains of the iodide of potassium were given in solution thrice a day. On the 17th the quantity of opium was diminished to one grain. On the 22d he had a warm bath to remove the stiffness in the joints; and on the 25th of February, he felt so well as to be able to leave the hospital

Case 4. *Acute Rheumatism with Endocarditis, treated by general blood-letting and calomel as a purgative, and in small doses with opium, without affecting the mouth. Recovery perfect.*—A female servant in the hospital, 21 years of age, of stout habit but strumous constitution, was admitted under my care on the 19th May, with slight pain and swelling of one ankle, brought on by having the feet wet. As the tongue was clean, and there was little or no constitutional disturbance, a few leeches were applied and an aperient given.

22d. The pain and redness almost entirely left the ankle yesterday forenoon, but the knees became very painful, and they are now swelled, but not red. Pulse 104, full; skin is hot and dry; tongue thickly coated. There is a slight murmur with the first sound over the aortic valves. Twelve ounces of blood were directed to be taken from the arm. A pill, with five grains of calomel and one of opium to be taken at night, and a purgative draught next morning. Also twenty minims of colchicum with soda to be given thrice daily.

23d. She is much better. The pain and swelling of the knees have subsided. Pulse 90, less full; tongue still coated; thirst moderate; bowels open; no palpitation or pain at the heart; murmur as before; blood buffy.

Colchicum mixture to be continued; and to have every fourth hour two grains of calomel and one-fourth of a grain of opium.

24th. She is improving. Pulse 78; skin cooler; tongue cleaner; gums not affected; no thirst; bowels open; less pain and swelling of the knees; the murmur, however, is rather more distinct. Medicines to be continued.

25th. She feels much better. Tongue cleaner; pain and swelling of knees nearly gone; but the murmur is undiminished, and the gums are not affected.

The use of the remedies to be continued.

28th. She feels quite well, and wishes to get up. The mouth is not affected, though she has taken the calomel and opium regularly every fourth hour; and the bowels have been open only about once a day. The mixture was omitted on the 26th. The pulse is only 58, and the roughness and slight prolongation of the first sound are unchanged. The calomel and opium to be continued.

29th. She feels perfectly well. The murmur, however, continues, and the calomel has not produced the slightest effect upon the gums.

She now left off all medicine, but was again examined on the 1st of June before being discharged, and the murmur was then no longer audible.

Case 5. *Acute Rheumatism and Endocarditis, treated by local depletion and calomel with opium. Recovery perfect.*—A woman, 28 years of age, rather fat, but of delicate constitution, and with a pale chlorotic complexion, was admitted on the 2d October, with swelling, redness, and pain of the knees and ankles. There was also some pain in the wrists and shoulders.

On the 3d the pulse was above 100, but not full. There were no signs of heart affection. Five grains of calomel with one of opium were ordered to be taken at night, and a dose of house medicine with tincture of colchicum next morning. The following day, though the bowels had been freely opened, the patient was worse. The pulse was 106, and very full. The sounds were still natural. As her constitution did not seem capable of bearing general blood-letting or active purging, two grains of calomel with half a grain of opium were given every fourth hour.

On the 5th it was found that by this she had been relieved, and had perspired very freely; but the gums were not yet affected. A very distinct murmur was audible with the first sound at mid-sternum, but there was no palpitation or pain in that situation. The calomel with opium was continued, and twenty minims of colchicum were given thrice a day with effervescing mixture.

On the 6th the mouth was sore. She was better, and the pulse was softer and less full, but the tongue continued much furred. The left hand and wrist were still sore, and the sounds of the heart at mid-sternum seemed muffled, while towards the apex there was a bellows murmur. The bowels were costive; and a draught of house medicine was ordered, and the colchicum continued.

On the 7th she felt much easier, the pain and swelling of the joints having nearly left her, but the symptoms and signs of the heart being affected were now much more decided. Though the pulse had fallen to 94, it was irregular, intermitting every fourth or fifth beat; and during the night there had been palpitation and an uncomfortable sense of constriction about the heart. The sounds were, as last described, still muffled at the base, and with a murmur towards the apex. Six leeches were applied to the heart, and the colchicum continued.

The following day (8th) there was a great improvement; scarcely any redness or swelling of the joints remained. There was no irregularity of the heart's action, and no bellows murmur was audible at the apex, but the muffled character of the sounds remained at the base. The tongue was still furred, and the gums affected by the calomel. She had been purged with pain in the bowels. She ceased taking medicine.

On the 10th she was convalescent. The tongue was clean; and pain and swelling had entirely left the joints. A bellows murmur was audible at the base of the heart and in the course of the aorta. She was again examined on the 16th, when no bellows murmur could be heard.

Case 6. *Acute Rheumatism with Endocarditis, treated by purgatives, cupping, and calomel with opium. Recovery perfect.*—W. Jonathan, a stout sailor, from Bangor, aged 21, was admitted on the 19th of May 1847, with a first attack of rheumatism, which had come on three days previous from exposure to wet and cold at sea. The right foot, which had been first affected, was red and much swelled. The other foot and the knees were also painful, and the right wrist was swelled. Pulse 106, not very full. No palpitation, pain, or murmur at the heart; tongue with a thick white fur; thirst and loss of appetite; bowels open.

He was ordered to have at bed-time ten grains of calomel and one grain and a half of opium in the form of two pills; and the following morning a draught consisting of two ounces of compound mixture of senna, one scruple of calcined magnesia, and half a drachm of tincture of meadow saffron.

20th. The bowels have been only once acted upon, but very freely; the tongue is cleaner, and the skin less hot; there is more swelling in the left foot, but less pain in the arms; pulse 106, not full; no signs of the heart being affected. Same pills and draught to be repeated.

21st. Rather better. Pulse 102; skin cooler; tongue less furred; thirst moderate. Bowels opened twice. Considerable pain, but less swelling in the joints. Scarcely any sleep. One grain of opium to be taken every sixth hour, six grains of calomel at bed-time, and the purgative draught in the morning.

22d. Much better. Slept several hours last night. Pulse 94. Bowels opened twice freely.

The opium to be continued, and the calomel and draught repeated.

24th. He is scarcely so well. Wrists much swelled; face flushed; pulse 96. Tongue, however, rather less coated, and bowels open. Towards the apex of the heart, the second sound is distinctly perceived to be broken into two sounds.

To be cupped over the region of the heart to eight ounces.

Two grains of calomel to be added to each grain of opium. To have three times daily one ounce of a mixture consisting of four drachms of tincture of meadow saffron, and four scruples of carbonate of magnesia in seven ounces and a-half of peppermint water.

26th. He is better. Pulse 86. Swelling of the wrists nearly gone. Tongue nearly clean; bowels costive. There is no pain at the heart, but three sounds can be distinctly heard from the second sound being divided.

The calomel and opium and the colchicum mixture to be continued, and the senna draught repeated.

27th. The gums are beginning to be affected, and he is decidedly better. The pulse has fallen to 70. There is still some pain in the joints, and the tongue is not quite clean.

28th. There is scarcely any swelling in the joints. The tongue is nearly clean, and he is in all respects better.

The following day the calomel and opium and the colchicum were left off, and, on the 1st of June, three grains of iodide of potassium were given thrice a-day. The remainder of the treatment consisted in the use of occasional warm baths and aperients, and on the 14th of June he was dismissed cured.

The period of treatment would perhaps have been shorter in this case, if the patient had been bled from the arm before other treatment was begun.

Case 7. *Sub-acute rheumatism with endocarditis and remarkably slow pulse, treated by purgatives, cupping, calomel with opium and friction with mercurial ointment.*—J. Pierce, aged 25, driver of a luggage cart to railway station, of intemperate habits, was admitted on the 19th of March 1847. He had suffered from cough since Christmas, but had never previously had rheumatism. Three days before admission, his hands began to swell, and the left knee and ankle were then red and swelled. Pulse

94, full; sounds of the heart natural; bowels not open for two days.

He was directed to have at the hour of rest ten grains of calomel with one grain of opium, in the form of two pills, to be followed next morning by a draught of the saline senna mixture, containing half a drachm of tincture of meadow saffron.

N. B. The saline senna mixture consists of infusion of senna with Epsom salts.

20*th*. The pain and swelling of the knee and ankle have subsided, but he has severe pain in the neck and left sterno-clavicular articulation. Pulse 98; thirst; tongue coated; bowels not acted upon. There is occasional intermission of the pulse, and the sounds of the heart are somewhat indistinct, but there is no murmur. He has some palpitation on moving himself or coughing, but no pain at the heart.

To be cupped to eight ounces. Two grains of calomel with half a grain of opium to be taken every fourth hour, and the purgative to be repeated.

21*st*. The wrists and hands are the only parts now swelled, and the patient feels better, having derived much relief at the chest from the cupping. The bowels were twice opened yesterday, and the first motion was quite black. Pulse 68, still full. The sounds of the heart are indistinct and muffled, and there is a soft murmur with the first sound at the base. The calomel and opium to be continued, and the purgative draught repeated in the morning.

22*d*. The patient is perfectly free from swelling, and has scarcely any pain in any of the joints. Pulse 66, regular. The sounds of the heart have the same indistinct muffled character, and the first is divided. He has a good deal of cough. The mercury seems beginning to act on the gums. The calomel and opium to be omitted.

23*d*. There is abatement in the severity of the general symptoms. Joints free from swelling. Tongue clean; bowels open; gums not affected; perspiration profuse, and with a sour smell; pulse 62, slightly irregular; sounds more muffled, and the first still broken. The calomel and opium to be taken again.

24*th*. There is cough with some sibilant rale and mucous expectoration. Feels only stiffness in the joints. The pulse is *remarkably slow*, only 44. The action of the heart is irregular, and the first sound prolonged and accompanied with a murmur. He complains of weakness. The gums are not sore, and the bowels not loose.

25*th*. He is free from pain, but feels depressed. *The pulse is still slow, only* 36, irregular and labouring. The sounds of the heart are indistinct, especially the first, and it is best heard towards the apex. The gums are not affected, and he states that last summer he took calomel on account of syphilis, but without any effect, and was at last salivated by corrosive sublimate. The calomel and opium to be continued, and a drachm of strong mercurial ointment to be rubbed upon the groins night and morning.

27th. The gums are beginning to be affected. The irregularity in the rhythm is very trifling, and the first sound is more distinct, though rough and prolonged. The pulse has risen to 48. The ointment to be rubbed in still. Calomel and opium to be left off.

31st. The gums are sore. The patient is sitting up, and feels well, except that he has griping pain in the bowels. To have immediately half an ounce of castor oil.

5th April. The ointment has not been rubbed in for two days, and the gums are not so sore. The pulse has risen to 60, and the sounds of the heart are regular, and without any murmur. He feels weak.

Five grains of iodide of potassium were ordered in infusion of gentian thrice a day.

On the 7th, an eruption of syphilitic lichen came out upon the legs, and some spots appeared on the face. He felt stronger, however.

On the 12th April, though the eruption had not entirely disappeared, he felt so well, that he did not wish to remain any longer in the hospital.

Remarks.—Pain at the heart was not a prominent symptom in any of these cases of endocarditis, and I have seldom seen it complained of to any great extent. In four of the five cases, there was some change in the rhythm of the heart; and in two there was an unnatural slowness of the pulse, which, in one case, fell to 58, and, in the other, as low as 36. This remarkable slowness of the pulse is a symptom of *endocarditis,* to which much attention has not, I believe, been directed by writers on diseases of the heart. I have, however, noticed it in a few other cases, and have at present under my care a woman in whom it has fallen as low as 40,—the endocardial affection being in this case complicated with both acute rheumatism and disease of the kidneys. Dr Taylor, in a note to his paper* on the causes of *pericarditis,* makes the following observation in reference to *endocarditis* occurring in cases of acute rheumatism. "I have observed the pulse to become decidedly less frequent, and each individual beat to be more slowly performed." He also remarks, that it might not have been expected that the contractions of the heart would become less frequent and tardy in a disease which must increase the sensibility of its lining membrane; and he compares the slowness of the pulse with the suspension of the peristaltic action of the intestines in *peritonitis*, and with the paralysis of the intercostal muscles, which some physicians believe to occur in pleuritis.

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* Medico-Chirurg. Trans. Vol. xxviii. 1845.

Capsular rheumatism.—In a severe case of this form of rheumatism, the sheaths of the abdominal muscles were affected as well as the joints; and at the epigastrium, where the patient frequently complained of pain, were felt hard tender lumps, which were thought to be of the same nature as the gouty concretions affecting all the small joints of the hands and feet. In two cases of capsular rheumatism, the eye was affected. One of them was the case of a man in whom the wrist and joints of the hand became red and painful during convalescence from dysentery. On two occasions, the inflammation left the joints and affected the eye, causing severe pain, and redness of the vessels of the sclerotic coat. As this patient had lost the sight of the other eye from a previous attack of the same kind, it was a matter of great importance to prevent any injury to the only remaining organ of vision. He was therefore leeched and blistered, but without any beneficial effect. Calomel and opium were then given, and when the mouth became sore, the inflammation immediately and entirely left the eye. It returned after his mouth had got well, and it became necessary to affect the mouth a second time, when the inflammation again disappeared as rapidly as before. He afterwards took iodide of potassium, and went out well.

In the second case, the inflammation of the eye was less severe, and yielded to less active means.

C. Walch, a middle-aged sailor, who had been five weeks ill, was admitted, on the 22d September 1847, in a state of utter helplessness, with pain in every joint, and effusion into the capsule of the left knee, the wrists, and most of the small joints. It came at first in one of his toes during the night. He was pale and debilitated, but his tongue was clean, and he was free from fever. There was redness, pain, and intolerance of light in the right eye. He was ordered to go into a warm bath, and to have at bed-time two grains of calomel and ten grains of Dover's powder, and in the morning a purgative draught, with infusion of senna, salts, calcined magnesia, and half a drachm of tincture of colchicum.

On the 23d he felt rather better, and the eye was less red and painful. Five grains of iodide of potassium were given thrice a day in infusion of gentian, and ten grains of Dover's powder every night.

On the 26th he was rapidly recovering under this treatment. His appetite was good, he felt stronger, and the pains had nearly left him. He continued this treatment, with the occasional use of warm baths, till the 21st October, when he had become much stouter, and had no affection of the joints beyond slight stiffness.

In treating capsular rheumatism, in addition to local depletion by leeches, I have used, where there has been much thickening, blisters, and afterwards a strong tincture of iodine,—the application of which has often been very beneficial. The internal remedies have been colchicum, with aperients; iodide of potassium, with compound decoction of sarsaparilla; the warm bath, and the mixture of guaiacum. In some anæmic cases requiring tonics, syrup of the iodide of iron has proved of the greatest service. In two cases, with great thickening of the capsule of the knee-joint, small doses of blue pill with acetic extract of colchicum were given, until a slight action was produced upon the gums; but it was not observed that this produced any decided effect upon the disease, though both cases ultimately got well.

III. Diseases of the Nervous System.

There were 60 cases of disease of the brain and nervous system in 1846, and 68 in 1847.

A case of serous apoplexy came under my care, in which the quantity of fluid effused into the ventricles of the brain was very great. The patient was a pale, fat, unhealthy-looking woman, 46 years of age, who was admitted with constipation, soreness of the gums, and pain in the head, caused by a blow received fifteen months previously. A short time before coming under my care, she had been in the hospital with pain in the head, for which she had been leeched and blistered. She was again blistered, and purged freely with calomel, but she sunk into a state of stupor with weakness of the lower extremities, but without paralysis, and died. Vascularity of the membranes of the brain and some opacity of the arachnoid were found. The brain was very firm, the lateral ventricles were immensely dilated with serous fluid, and there was also much fluid at the base of the brain. The liver was very coarse in structure, and all the organs were rather anæmic. It is worthy of remark that there was no paralysis except some twisting of the mouth.

Chorea.—Two cases of St Vitus' dance have come under my care.

Case 1 was an obstinate one. The girl, who was 11 years of age, having been long ill with spasmodic movements in the hands, arms, and legs, and with twitching of the muscles of the face. She had been subjected to a variety of treatment before being admitted. When I first saw her, on the 26th of January 1846, there was some febrile disturbance, and she had considerable heat of skin, thirst, and some pain in the head. Two grains of calomel, with four of the compound powder of scammony, were given, and on the following day a blister was applied to the nape of the neck, and the powder repeated. She took also a saline mixture with antimony, and on the 2d of February, and again on the 4th, a draught with castor-oil and turpentine was prescribed. The febrile symptoms and pain in the head being removed, she was ordered to take ten grains of the carbonate of iron with two of rhubarb and two of compound cinnamon powder, twice a day, and to have the shower bath every morning. She gradually improved under this treatment, and the twitching movements of the hands and face diminished. On the 26th of February, half a drachm of the syrup of iodide of iron was given instead of the powders, and on the 4th of March she was able to walk steadily, and left the hospital quite well.

Case 2. Thomas, a girl 14 years of age, of healthy appearance, and rather stout, was admitted on the 31st of December, with irregular rapid movements of almost all parts of the body, but especially of the arms and legs. They had been present for three weeks, and had been gradually getting more uncontrollable. The only treatment she had been subjected to, consisted in the use of aperient medicine, and the application of a few leeches over the spine in the lumbar region. She had no pain in any part. The skin was rather hot, and the pulse 100. The tongue, which was protruded quickly and rapidly withdrawn, was slightly furred. The bowels were costive. She had menstruated several times regularly. She was ordered to take at bed-time a powder, with three grains of calomel and five grains of rhubarb; and in the morning a draught, with two drachms of castor-oil and the same amount of oil of turpentine. By these medicines she was freely purged; and the motions being of a dark colour, the remedies were repeated until the secretions were brought to a healthy state. Citrate of quinine and iron was then given in infusion of columba, but under the use of these medicines she did not make rapid progress. On the 13th, though the twitching was less violent, there was not any great improvement. A liniment, with extract of belladonna and opiate liniment, was ordered to be rubbed upon the spine, and the citrate of quinine and iron to be continued. On the 17th, though she was better, and had the tongue clean and the bowels regular, there was considerable involuntary movement in the arms and legs. Twenty minims of the syrup of the iodide of iron were given thrice a day in water, instead of the citrate of quinine and iron. From this time she got rapidly better. On the 19th, she could walk well, and on the 30th of January, she had scarcely any involuntary movement. On the 3d of February, she left the hospital cured.

Case of epileptic convulsions with irregular menstruation and uterine and spinal irritation, treated by chalybeate medicines and *blistering.*—A girl, 18 years of age, of pale, chlorotic complexion, but rather fat, came under my care on the 31st of May, during the absence of my colleague, Dr Scott, under whose charge she had been admitted. She had been blistered at the nape of the neck, and had taken compound mixture of iron with aloes. She had twice inhaled ether, which had cut short the paroxysms, but without having produced any permanent beneficial effect. She had generally two or three paroxysms of convulsion each day. During a severe fit, I observed that the muscles of the face were spasmodically contracted, the jaws firmly closed, the arms and hands contracted, and the legs and body perfectly stiff. She was perfectly insensible. The head was rather hot and the face flushed. When the fit went off, it left some pain in the head, but no increased pulsation of the carotids or symptoms of determination of blood to the head. She had noise in the head, but no giddiness. A loud continuous murmur was audible on placing the stethoscope over the veins of the neck on the left side. She had palpitation of the heart. The tongue was pale but clean, and the bowels were open. For six months she had not menstruated except once lately. She had leucorrhœa. There was tenderness at the lower part of the abdomen on pressure, also in a spot about the centre of the left scapula, and on pressing the spinous processes between the shoulders.

Six grains of the compound extract of colocynth with four of blue pill, were given, and followed by an enema with an ounce of assafœtida mixture, and half an ounce of turpentine.

On the 2d of June half an ounce of the compound mixture of iron with the same quantity of the compound decoction of aloes and half a drachm of the tincture of valerian were ordered thrice a day. On the 4th she seemed better, though she had had a fit the day before. An embrocation with extract of belladonna was ordered to be rubbed upon the spine. On the 5th she was able to sit up, she was improving in appearance, and the fits were less severe. On the 10th she was not so well, having again had the fits more frequently. On the 12th her general health had improved very greatly under the use of the mixture with iron and aloes, her colour was much better, and her appetite good. There was still, however, tenderness on pressure, over a spot about the centre of the dorsal portion of the spinal column, and the fits continued. A blister, five inches by two, was applied over this part of the spine, and from that time she had no return of the fits.

IV. DISEASES OF THE RESPIRATORY ORGANS.

This formed, in 1847, the most numerous class of diseases; but during the previous year, diseases of the intestinal canal formed a more numerous class, owing to the prevalence of diarrhœa and dysentery. In both years, diseases of the respiratory organs were the most fatal class, chiefly in consequence of the number of cases of pulmonary consumption admitted. In 1846 there were 152 cases of disease of the organs of respiration, 29 of which died; and in 1847 there were 172, of which 36 died. The inflammatory diseases are not usually of so well marked a sthenic character as to admit of much general depletion, and many are admitted in too advanced a stage to bear it at all. The following selection of cases will show what sort are usually received into the hospital, and the treatment pursued.

Case 1. *Acute bronchitis in an advanced stage.*—Mary Rooney, a stout but flabby woman, 50 years of age, was admitted on the 29th of June with cough and bronchitis of three weeks' duration. She was apparently in a very hopeless condition; the surface being cold and the face livid. The pulse was 100, very small and feeble, and the ankles were œdematous. There was urgent dyspnœa, and the sounds of the heart could not be heard at all with the stethoscope, owing, it was thought, to some serous effusion within the pericardium. The sound, on percussion, was clear over the chest, and sonorous sibilant and mucous rattles were everywhere audible. The tongue was covered with a dark yellow coat.

A sinapism was applied to the chest and warmth to the feet. Four ounces of wine were ordered for her, and also the following draught to be taken every fourth hour: sesquicarbonate of ammonia, five grains; tincture of squill, ten minims; ipecacuan wine, fifteen minims; camphor mixture, one ounce. These means acted well, restoring the temperature and circulation, and promoting expectoration. The following day there was a remarkable improvement in regard to the thoracic symptoms, but the tongue was still coated, and she complained loudly of pain in the head. The pupils were much contracted. A blister was applied between the shoulders high up, so as to act upon both the head and chest. On the 1st of July she was in all respects better, and the œdema of the ankles had entirely disappeared. On the 10th she was able to take a grain of quinine three times a day. She gained strength, and on the 20th of July left the hospital cured.

Case 2. *Inflammation of the left lung and pleura, and subsequently of the right, with typhoid symptoms and well marked physical signs; disease arrested by mercurial inunction; signs of resolution and recovery with expansion of left side slightly impaired*—W. Loch, a Prussian sailor, aged 23, was admitted on the 1st of November. He had not been well for a month, and five days before admission he caught cold from sleeping without a shirt. He had shivering and stiffness of the neck, and was confined to bed. He seemed heavy and stupid, like a patient with typhoid fever. He did not complain of pain in any particular part, but said he had headach and pains in the back and limbs. The tongue was slightly furred, and there was some thirst. The skin was not very hot, and the pulse was 80, small. He had but little cough, and nothing abnormal was perceived on examining the chest. Sulphate of magnesia with tartar-emetic was prescribed for him, and the following day he took three grains of calomel at bed-time, followed by house medicine the next morning.

On the 4th the symptoms continued with little change except that he had more cough and some soreness at the sternum. With the stethoscope sibilant rattle was heard in different parts of the chest. He was ordered to take three times daily a draught consisting of two drachms of solution of acetate of ammonia, ten minims of antimonial wine, half a drachm of spirit of nitrous ether, and six drachms of camphor mixture.

On the evening of the 5th he had a rigor, and on the 7th I found that he had catching pain in breathing, and that there was pain also on pressing at the lower part of the left side of the chest. Very slight crepitation could be heard in the same situation, and rubbing of the pleura was perceived. Posteriorly on the same side the sound on percussion was duller, and the respiratory murmur feebler than on the right. No aegophony. Pulse 100.

To be cupped to eight ounces, and to have a blister applied.

8th. The blood is very fluid without any appearance of buff. There seems to be no improvement, and there is still pain in the side. Countenance, however, less heavy. Pulse 100, small; skin not hot; tongue rather more furred; thirst; no expectoration. There is more dulness at the lower part of the left side, and crepitation is extending upwards towards the inferior angle of the scapula. There is increased resonance of the voice and cough in this situation.

Two grains of calomel with a quarter of a grain of opium were ordered to be taken every third hour.

9th. Still pain in the left side and greater difficulty of breathing. Much thirst; pulse 104; skin hot; bowels open four times. There is dulness as high as the lower angle of the scapula and aegophony in this situation. Respiration bronchial.

10th. Little alteration in the symptoms or physical signs. Pulse 98. The patient complains of cold, and trembles; the vibration of the voice is felt less distinctly with the hand on the left than on the right side.

11th. There is still dyspnœa and pain in the side. Pulse 114;

tongue dry, not much furred; bowels loose; physical signs unchanged.

A blister to be applied; and to have three times daily a draught consisting of two drachms of liquor of acetate of ammonia, ten minims of ipecacuan wine, half a drachm of spirit of nitrous ether, and six drachms of camphor mixture.

13*th*. He feels better, and perspires copiously. Pulse 112; tongue scarcely furred; crepitation at the summit of the lung posteriorly; bronchial respiration and aegophony towards the lower angle of the scapula.

17*th*. No improvement. He has complained for two days of pain in the right shoulder, and crepitant rale is heard in the infra-scapular region, inflammation seeming to have commenced about the middle of the lung. There is dulness on percussion and bronchial respiration, and bronchophony below this. Pulse weak, 112; tongue clean; gums not affected by the calomel and opium; bowels not purged.

Mercurial ointment to be rubbed in the groins.

18*th*. Gums slightly swelled.

20*th*. Gums more affected. Respiration in right lung stronger, but mixed with some sibilant and mucous rattles; no bronchophony; on the left side enlargement and diminished motion; aegophony is still heard at the lower angle of the scapula; the tongue is clean; no expectoration; pulse 108; skin moist; bowels open thrice a-day.

The ointment to be rubbed in still, and the other medicines omitted.

22*d*. Improves slowly. Gums but slightly affected; pulse 104; some pain still in the right shoulder, and respiration is here slightly obscured by sibilant rattle; no change in the left lung.

The ointment to be continued; and to have three times daily three grains of iodide of potassium, ten minims of tincture of squill, and half a drachm of spirit of nitrous ether in one ounce of camphor mixture.

24*th*. There is a great improvement in the appearance of the patient; there is some appetite; the respiration is easy; the pulse 98; and the skin perspiring. The mixture and ointment to be continued.

26*th*. Marked improvement. Pulse 90; appetite good; more respiration is heard in the left side, but it is of a bronchial character; and there is still aegophony; when he coughs there is a sound as if two polished surfaces, with oil interposed, were separated; gums still affected, though slightly.

28*th*. Rubbing sound is now distinctly heard on the left side above and below the lower angle of the scapula. Returning crepitant rattle is also audible; the appetite is good. The use of the ointment was stopped the following day, and on the 2d of December, as he still complained of pain in the shoulder, a small blister was applied. On the 4th he complained of severe neuralgic pain in the head, and the mixture with iodide of potassium was omitted.

10th. He has been taking a mixture with quinine, and the pain in the head is relieved. Bowels open, from blue pill and an aperient draught. He has been expectorating a large quantity of muco-purulent matter, which is now diminishing. Returning crepitant and mucous rattles have been very distinctly perceived in the posterior part of the left lung, and the sound on percussion is still dull, and respiration is feeble. The air, however, enters every part of the lung.

5th January. He has gained flesh and improved in appearance; and there is now very little expectoration, and scarcely any mucous rattle in the lower part of the left side of the chest.

12th. The patient has been gaining strength, and is nearly free from cough. The lower part of the left side of the chest expands less during inspiration than the right. He leaves the hospital to-day.

13th February. The patient has again presented himself at the hospital, on account of a pain in the bowels. He has lost his cough, and has grown stout. The lower part of the left side still expands less than the right, but more than when he left the hospital. The vesicular murmur is loud and clear, but not quite so strong as on the right side.

Remarks.—This was a well-marked case of the asthenic or typhoid form of pneumonia, and its slow progress afforded a good opportunity of tracing all the most important physical signs furnished during pleuritic effusion, hepatization, absorption of the fluid, and resolution of the pneumonic consolidation. The symptoms and physical signs did not at first indicate anything more than slight *bronchitis;* but a rigor was followed by sharp pleuritic pain, and, in addition to the rubbing of the *pleura*, slight dulness on percussion, and aegophony, crepitation was perceived, showing that the tissue of the lung also was inflamed. The progress of the disease was not checked, nor were its symptoms alleviated by cupping and the application of a blister; and the increased dulness inferiorly showed that the effusion became greater, while the extension of crepitation towards the summit of the lung, and the bronchial respiration and cough, indicated the progress of pneumonia upwards. The disease continued to make progress, notwithstanding the employment of calomel with opium, and even extended to the right lung. The system not being affected after nine days' use of calomel, mer-

curial ointment was rubbed in, and quickly affected the constitution. Its beneficial effects were at once seen in the progress of the disease in both lungs being immediately checked. We then trace the resolution of the disease, the diminution of dulness, the return of the rubbing sound, and the returning crepitant rattle accompanied with abundant muco-purulent expectoration. The respiration, at first bronchial, gradually became stronger and clearer, while the side expanded more freely, and the return of the lung to the natural condition was as nearly as possible perfect, and much more so than might have been expected, considering the length of time it was in the state of consolidation and compression. The slight deficiency of expansion, and the feebleness of the respiration, must have been caused either by adhesion of the pleura, or by some of the air-cells not having regained their previous condition. During convalescence, the patient had severe neuralgic pain, first in the shoulder, and afterwards in the head; and as it was thought that this might be caused by the iodide of potassium, which he was then taking with the view of promoting absorption of the fluid within the pleura and the lymph deposited in the tissue of the lung, it was omitted; and he subsequently made rapid progress to convalescence under the use of quinine.

Case 3. *Pleurisy after lifting a heavy weight; irregularity of the pulse and a bellows murmur at the heart; treatment by calomel, cupping, and blistering; recovery, with deficient expansion of left side.*—W. Thomas, aged 22, of rather spare habit, was admitted on the 17th of March. He had been at sea until a year previous, when he fell and injured his head. His intellect was deranged for some time after, and his sight continued impaired. He was employed in a flour shop until about a month before admission, when he injured his side by lifting a heavy weight. But before this, he had suffered from cough with some expectoration. Eight days ago the pain got worse, and he had a rigor. There is now pain in the left side of the chest and at the epigastrium on pressure. There is less motion in the left side during respiration, also slight dulness and diminution of the respiratory murmur. There is thirst, the tongue is dry, and the bowels constipated. The skin is not hot, but the pulse is very quick, small, and irregular. The action of the heart is very irregular, but no abnormal sound is perceived.

Eight ounces of blood to be taken from the side by cupping; five grains of calomel and five grains of antimonial powder to be taken immediately, and a dose of house medicine four hours after.

18*th*. The pain was relieved by the cupping; the pulse is now regular, 80. The medicine caused vomiting, and he has been

freely purged. There is expectoration of some frothy mucus. There is slight friction sound on the left side, and some subcrepitant and sonorous rattles. The dulness has not increased, and there is no aegophony.

A blister to be applied, and a pill of two grains of calomel and one third of a grain of opium to be taken every third hour.

19th. He seems rather better, but the blister has not yet risen, and there is still pain in the side, with troublesome cough and frothy expectoration. Thirst continues, but the pulse is only 78. Friction sound is no longer audible.

To have every fourth hour a draught consisting of half a drachm of antimonial wine, two drachms of solution of acetate of ammonia, and half a drachm of spirit of nitrous ether, with five drachms of camphor mixture.

20th. The cough is easier. Pulse 74. Gums not affected.

23d. There is still some fever, and slight pain in the side. Pulse 84. Tongue not clean, and rather dry. The calomel was omitted yesterday, but the gums do not seem to be sufficiently affected yet. There is considerable dulness at the lower part of the left side, and it moves to the most dependent part of the chest when the position of the patient is changed. Aegophony is now heard. The patient feels no palpitation of the heart, but its action is irgular, and there is a slight bellows murmur with the first sound.

A blister to be applied over the region of the heart, and the pills with calomel and opium continued.

24th. The gums are sore. The blister has risen, and the patient seems better. The pulse is 76, and the action of the heart is quite regular. The first sound has, however, a peculiar muffled character. Pills of calomel and opium to be omitted.

27th. There is decided improvement. The gums are still sore. The pulse is regular. There is no aegophony, and the dulness at the lower part of the left side is very slight.

3d April. The patient is going on favourably. He has been taking no medicine, except occasionally a tea-spoonful of a mixture of equal parts of the oxymel of squill and compound tincture of camphor for the relief of the cough. The gums are still slightly under the influence of mercury. The tongue is quite clean, and the appetite good. He is not entirely free from pain in the left side, and there is deficient expansion on full inspiration at the lower part, as if the lung were bound by adhesions. The sound on percussion is less clear than on the right side, and respiration, though free from rattles, is feebler than on the other. The resonance of the voice is natural. The first sound of the heart is today, for the first time, free from abnormal sound, and quite natural.

curial ointment was rubbed in, and quickly affected the constitution. Its beneficial effects were at once seen in the progress of the disease in both lungs being immediately checked. We then trace the resolution of the disease, the diminution of dulness, the return of the rubbing sound, and the returning crepitant rattle accompanied with abundant muco-purulent expectoration. The respiration, at first bronchial, gradually became stronger and clearer, while the side expanded more freely, and the return of the lung to the natural condition was as nearly as possible perfect, and much more so than might have been expected, considering the length of time it was in the state of consolidation and compression. The slight deficiency of expansion, and the feebleness of the respiration, must have been caused either by adhesion of the pleura, or by some of the air-cells not having regained their previous condition. During convalescence, the patient had severe neuralgic pain, first in the shoulder, and afterwards in the head; and as it was thought that this might be caused by the iodide of potassium, which he was then taking with the view of promoting absorption of the fluid within the pleura and the lymph deposited in the tissue of the lung, it was omitted; and he subsequently made rapid progress to convalescence under the use of quinine.

Case 3. *Pleurisy after lifting a heavy weight; irregularity of the pulse and a bellows murmur at the heart; treatment by calomel, cupping, and blistering; recovery, with deficient expansion of left side.*—W. Thomas, aged 22, of rather spare habit, was admitted on the 17th of March. He had been at sea until a year previous, when he fell and injured his head. His intellect was deranged for some time after, and his sight continued impaired. He was employed in a flour shop until about a month before admission, when he injured his side by lifting a heavy weight. But before this, he had suffered from cough with some expectoration. Eight days ago the pain got worse, and he had a rigor. There is now pain in the left side of the chest and at the epigastrium on pressure. There is less motion in the left side during respiration, also slight dulness and diminution of the respiratory murmur. There is thirst, the tongue is dry, and the bowels constipated. The skin is not hot, but the pulse is very quick, small, and irregular. The action of the heart is very irregular, but no abnormal sound is perceived.

Eight ounces of blood to be taken from the side by cupping; five grains of calomel and five grains of antimonial powder to be taken immediately, and a dose of house medicine four hours after.

18*th.* The pain was relieved by the cupping; the pulse is now regular, 80. The medicine caused vomiting, and he has been

freely purged. There is expectoration of some frothy mucus. There is slight friction sound on the left side, and some subcrepitant and sonorous rattles. The dulness has not increased, and there is no aegophony.

A blister to be applied, and a pill of two grains of calomel and one third of a grain of opium to be taken every third hour.

19*th.* He seems rather better, but the blister has not yet risen, and there is still pain in the side, with troublesome cough and frothy expectoration. Thirst continues, but the pulse is only 78. Friction sound is no longer audible.

To have every fourth hour a draught consisting of half a drachm of antimonial wine, two drachms of solution of acetate of ammonia, and half a drachm of spirit of nitrous ether, with five drachms of camphor mixture.

20*th.* The cough is easier. Pulse 74. Gums not affected.

23*d.* There is still some fever, and slight pain in the side. Pulse 84. Tongue not clean, and rather dry. The calomel was omitted yesterday, but the gums do not seem to be sufficiently affected yet. There is considerable dulness at the lower part of the left side, and it moves to the most dependent part of the chest when the position of the patient is changed. Aegophony is now heard. The patient feels no palpitation of the heart, but its action is irgular, and there is a slight bellows murmur with the first sound.

A blister to be applied over the region of the heart, and the pills with calomel and opium continued.

24*th.* The gums are sore. The blister has risen, and the patient seems better. The pulse is 76, and the action of the heart is quite regular. The first sound has, however, a peculiar muffled character. Pills of calomel and opium to be omitted.

27*th.* There is decided improvement. The gums are still sore. The pulse is regular. There is no aegophony, and the dulness at the lower part of the left side is very slight.

3d April. The patient is going on favourably. He has been taking no medicine, except occasionally a tea-spoonful of a mixture of equal parts of the oxymel of squill and compound tincture of camphor for the relief of the cough. The gums are still slightly under the influence of mercury. The tongue is quite clean, and the appetite good. He is not entirely free from pain in the left side, and there is deficient expansion on full inspiration at the lower part, as if the lung were bound by adhesions. The sound on percussion is less clear than on the right side, and respiration, though free from rattles, is feebler than on the other. The resonance of the voice is natural. The first sound of the heart is today, for the first time, free from abnormal sound, and quite natural.

7th. He is quite well, though expansion is still deficient on the left side. Discharged cured.

Remarks.—The complication of the signs of endocardial inflammation with well-marked pleuritis is the chief point worthy of notice in this case. The pain at the epigastrium and in the left side might have been caused either by endocardial or pleuritic inflammation; but pain is a much less constant symptom of the former than of the latter. The first sign which induced a suspicion of endocarditis was the irregularity of the heart's action; and when to this was afterwards added the bellows murmur at the base of the heart, and the muffled character of the sounds, no doubt of its existence could be entertained. The two diseases required the same plan of treatment, with hardly any modification, and cupping, blistering, and the action of mercury on the system seemed to restore the heart to its natural condition, whilst they, at the same time, removed any fluid effused into the pleura. The deficient expansion which remained was no doubt caused by some adhesions. The cause of the endocarditis in this case is a point worthy of inquiry. It is a well ascertained fact, that, in the majority of cases, endocarditis arises from acute rheumatism, or in consequence of disease of the kidneys. Many cases of valvular disease of the heart cannot, however, be traced to either of these diseases, and the causes of such cases are still open for investigation. Some of them probably arise from attacks of endocarditis, induced by some of the common causes of inflammation, such as exposure to cold, and occur either alone, or, as in this case, in conjunction with inflammation of some part within the chest.

Case 4. *Pneumonia with jaundice.—Post-mortem examination.*—John Rowe, a stout sailor, aged 28, who had been in warm climates, was admitted, on the 19th of March, with cough and pain in the chest. He was slightly jaundiced. The tongue was furred, yellow, and the pulse small and quick. A blister was applied to the right side of the chest, and he was freely purged with calomel and antimonial powder and house medicine. On the following day the face was slightly flushed, the cough very troublesome, and the expectoration rusty. There was considerable thirst, and the pulse was 112, rather small; but the tongue was cleaner.

The physical signs were, dulness on percussion about the centre of the right lung posteriorly; bronchial respiration and crepitation in the same situation and lower down; and some subcrepitant and sonorous rales on the left side before and behind.

Twelve ounces of blood were taken from the arm without causing faintness, and a pill containing two grains of calomel, a sixth of a grain of tartar emetic, and a third of a grain of opium was given every fourth hour.

On the 21st he felt very low, and the pulse was 96, very weak. The expectoration was very abundant, red, and frothy, and there was rattling in the chest. The dulness at the lower part of the right side was complete. There was bronchial respiration over the centre of the right lung. Three ounces of wine were ordered, and also a stimulating mixture with carbonate of ammonia, chloric ether, and tincture of squill. In the evening, the quantity of frothy mucus in the bronchial tubes was so great as to threaten suffocation, and an emetic, with two scruples of carbonate of ammonia in two ounces of water, was given. This cleared away the mucus from the bronchial tubes, and he rallied surprisingly after it. The pills were continued without the antimony, and also the stimulating mixture. The mucus again accumulated in the evening, and, though the emetic was repeated, he died on the morning of the 23d March.

Inspection.—There was adhesion of the right *pleura*, partly recent and partly old; also very firm deposit of false membrane between the lower lobe and the diaphragm, and between the lobes of the lung, glueing them together. The lower lobe was in the third stage of inflammation, and of a whitish-yellow colour from infiltration of purulent matter. It had a granulated appearance, and was easily broken down. The middle lobe was in the first stage of inflammation, and was separated from the lower lobe by a white line formed by the lymph effused into the fissure. The left lung was gorged with blood, but not inflamed. The mucous membrane was very red.

The heart was healthy.

The liver was large, and of a yellow colour and nutmeg appearance. The gall-bladder contained extremely dark viscid bile, and a gall-stone of dark colour, and consisting of small granular aggregated particles. The spleen was large, and the kidneys were large and flabby.

Case 5. *Pleuro-pneumonia and bronchitis.—Post-mortem examination.*—C. Baker, a sailor, aged 26, was admitted on the 27th December 1847. He had been ill for a week, but had got much worse the two last days, and had been bled the day before he was admitted. He had agonizing pain in the right side about the cartilages of the ribs, which impeded his breathing so much that it was thought he had diaphragmatic pleurisy. The face was slightly flushed, and the pulse 120, small. The tongue furred. Sibilant rale was heard on both sides of the chest. At the lower part of the right side the respiration was feeble, and the sound on percussion rather dull. Ten leeches were applied with considerable relief, and he took every fourth hour a pill

Case 8. *Tubercular disease of the left lung, with pleurisy of the same side, subsequently peritonitis and pleurisy of the right side.—Post-mortem examination.*—E. Jones, aged 27, a servant residing at Rock Ferry, was admitted on the 24th May 1847. She had been ill with cough for thirteen weeks, and, a few days before being admitted, she was attacked with severe pleuritic pain in the left side, for which she was bled from the arm with relief and also blistered. Though she said that she had lost flesh, she was still very stout-looking. Her tongue was much furred; there was thirst and no appetite; the pulse was 96. There was still some pain in the left side, the whole of which sounded dull on percussion. At the lower part respiration was suppressed, and below the clavicle there were pectoriloquy and cavernous rattle and voice. The general symptoms showed that febrile action had not entirely subsided, and another blister was applied, and a saline mixture with antimony was ordered. On the 27th, a mixture with oxymel of squill, compound tincture of camphor, and hydrocyanic acid was given to relieve the cough. She improved under this treatment, and, on the 2d of June, iodide of potassium was given in three-grain doses in infusion of gentian. On the evening of the 5th, she had a rigor followed by extreme tenderness in the abdomen. · The pulse rose to 120, and was feeble and undulating. She had also bilious vomiting. The suddenness of the attack and the severity of the symptoms made it appear not improbable that perforation of the stomach or intestines had taken place, and calomel with opium was prescribed, and hydrocyanic acid with carbonate of ammonia was given to relieve the sickness. On the 8th she no longer complained of pain in the abdomen, but of severe pain in the right side of the chest. On examining the part, friction sound was heard. *Acetum cantharidis* was rubbed upon the part, but she died the same evening.

Inspection.—The upper part of the left lung was adherent in about one-third of its extent. The adhesion was produced by a thick layer of semiorganized lymph, which was separated by firm pressure, and then exhibited a rough reddish surface. The lower part of the pleura was free from adhesion, and contained three or four pints of a yellowish-red fluid mixed with flakes of lymph. The lung was pushed up towards the clavicle, where it was firmly adherent, and it was compressed to less than half its natural size. Towards the summit of the lung there were tubercles, and one cavity the size of a large walnut, and some of smaller size. All the anterior part of the upper lobe was dense and hard, of a greenish-blue colour, and filled with miliary tubercles. The pleura of the right lung contained about one pint of reddish fluid, and there was some deposit of lymph. The lung itself contained a dark muddy serosity, which exuded abundantly when it was cut. At the apex there was a cicatrized mark, from which a cretaceous tubercle was extracted.

The *peritoneum* contained a pint or two of fluid mixed with flakes of lymph. Purulent lymph was deposited in some places between the intestinal folds, and there was some redness of the *peritoneum*, but no tubercular deposit or ulceration could be found at the lower end of the *ileum*, or in the cæcum or colon.

This case is remarkable from the extent of inflammation which occurred in the serous cavities, and successively affected the left pleura, the peritoneum, and the right pleura, producing an abundant effusion of serum, lymph, and even some pus in the peritoneum.

Case 9. *Hæmoptysis with crepitation in the lower part of right lung; hæmorrhage arrested by turpentine.*—James Lyon, a labourer, aged 50, of large frame, but rather pale, was admitted on the 30th of June with cough and spitting of blood. He had not been free from cough for six months, and he began to spit blood three weeks before entering the hospital. The tongue was brown and furred; the skin rather hot; and the pulse 98. He had some pain at the pit of the stomach, and at the lower part of the right side of the chest. In the latter situation there seemed to be slight dulness on percussion, and there was some friction sound, and during inspiration fine crepitation. Eight ounces of blood were taken from the side by cupping, and an eighth of a grain of tartar emetic and a drachm of compound tincture of camphor were given in camphor mixture thrice a day.

On the 2d July he was still expectorating large quantities of blood of a florid colour, and mixed with frothy mucus. He was free from pain, but weak. His bowels had been opened by castor oil, and his tongue was cleaner. There was no thirst; the skin was cool; and the pulse 94, small. There was still abundance of crepitating rattle at the lower part of the right side of the chest, but no friction sound, and scarcely any appreciable dulness on percussion. The other parts of the chest and the sounds of the heart were healthy. The following medicines were prescribed:—two drachms of oil of turpentine; one ounce of mixture of gum arabic in seven ounces of cinnamon water; one ounce thrice a day; with five grains of compound conium pill three times daily.

On the following day the spitting of blood had entirely ceased, and the expectoration consisted of mucus with hardly a tinge of blood. There was still, however, abundance of crepitating rattle.

The medicines were continued, and on the 5th there had been no return of the spitting of blood, but the cough and mucus ex-tongue dry, not much furred; bowels loose; physical signs unchanged.

A blister to be applied; and to have three times daily a draught consisting of two drachms of liquor of acetate of ammonia, ten minims of ipecacuan wine, half a drachm of spirit of nitrous ether, and six drachms of camphor mixture.

13*th.* He feels better, and perspires copiously. Pulse 112; tongue scarcely furred; crepitation at the summit of the lung posteriorly; bronchial respiration and aegophony towards the lower angle of the scapula.

17*th.* No improvement. He has complained for two days of pain in the right shoulder, and crepitant rale is heard in the infra-scapular region, inflammation seeming to have commenced about the middle of the lung. There is dulness on percussion and bronchial respiration, and bronchophony below this. Pulse weak, 112; tongue clean; gums not affected by the calomel and opium; bowels not purged.

Mercurial ointment to be rubbed in the groins.

18*th.* Gums slightly swelled.

20*th.* Gums more affected. Respiration in right lung stronger, but mixed with some sibilant and mucous rattles; no bronchophony; on the left side enlargement and diminished motion; aegophony is still heard at the lower angle of the scapula; the tongue is clean; no expectoration; pulse 108; skin moist; bowels open thrice a-day.

The ointment to be rubbed in still, and the other medicines omitted.

22*d.* Improves slowly. Gums but slightly affected; pulse 104; some pain still in the right shoulder, and respiration is here slightly obscured by sibilant rattle; no change in the left lung.

The ointment to be continued; and to have three times daily three grains of iodide of potassium, ten minims of tincture of squill, and half a drachm of spirit of nitrous ether in one ounce of camphor mixture.

24*th.* There is a great improvement in the appearance of the patient; there is some appetite; the respiration is easy; the pulse 98; and the skin perspiring. The mixture and ointment to be continued.

26*th.* Marked improvement. Pulse 90; appetite good; more respiration is heard in the left side, but it is of a bronchial character; and there is still aegophony; when he coughs there is a sound as if two polished surfaces, with oil interposed, were separated; gums still affected, though slightly.

28*th.* Rubbing sound is now distinctly heard on the left side above and below the lower angle of the scapula. Returning crepitant rattle is also audible; the appetite is good. The use of the ointment was stopped the following day, and on the 2d of December, as he still complained of pain in the shoulder, a small blister was applied. On the 4th he complained of severe neuralgic pain in the head, and the mixture with iodide of potassium was omitted.

10th. He has been taking a mixture with quinine, and the pain in the head is relieved. Bowels open, from blue pill and an aperient draught. He has been expectorating a large quantity of muco-purulent matter, which is now diminishing. Returning crepitant and mucous rattles have been very distinctly perceived in the posterior part of the left lung, and the sound on percussion is still dull, and respiration is feeble. The air, however, enters every part of the lung.

5th January. He has gained flesh and improved in appearance; and there is now very little expectoration, and scarcely any mucous rattle in the lower part of the left side of the chest.

12th. The patient has been gaining strength, and is nearly free from cough. The lower part of the left side of the chest expands less during inspiration than the right. He leaves the hospital to-day.

13th February. The patient has again presented himself at the hospital, on account of a pain in the bowels. He has lost his cough, and has grown stout. The lower part of the left side still expands less than the right, but more than when he left the hospital. The vesicular murmur is loud and clear, but not quite so strong as on the right side.

Remarks.—This was a well-marked case of the asthenic or typhoid form of pneumonia, and its slow progress afforded a good opportunity of tracing all the most important physical signs furnished during pleuritic effusion, hepatization, absorption of the fluid, and resolution of the pneumonic consolidation. The symptoms and physical signs did not at first indicate anything more than slight *bronchitis*; but a rigor was followed by sharp pleuritic pain, and, in addition to the rubbing of the *pleura*, slight dulness on percussion, and aegophony, crepitation was perceived, showing that the tissue of the lung also was inflamed. The progress of the disease was not checked, nor were its symptoms alleviated by cupping and the application of a blister; and the increased dulness inferiorly showed that the effusion became greater, while the extension of crepitation towards the summit of the lung, and the bronchial respiration and cough, indicated the progress of pneumonia upwards. The disease continued to make progress, notwithstanding the employment of calomel with opium, and even extended to the right lung. The system not being affected after nine days' use of calomel, mer-

curial ointment was rubbed in, and quickly affected the constitution. Its beneficial effects were at once seen in the progress of the disease in both lungs being immediately checked. We then trace the resolution of the disease, the diminution of dulness, the return of the rubbing sound, and the returning crepitant rattle accompanied with abundant muco-purulent expectoration. The respiration, at first bronchial, gradually became stronger and clearer, while the side expanded more freely, and the return of the lung to the natural condition was as nearly as possible perfect, and much more so than might have been expected, considering the length of time it was in the state of consolidation and compression. The slight deficiency of expansion, and the feebleness of the respiration, must have been caused either by adhesion of the pleura, or by some of the air-cells not having regained their previous condition. During convalescence, the patient had severe neuralgic pain, first in the shoulder, and afterwards in the head; and as it was thought that this might be caused by the iodide of potassium, which he was then taking with the view of promoting absorption of the fluid within the pleura and the lymph deposited in the tissue of the lung, it was omitted; and he subsequently made rapid progress to convalescence under the use of quinine.

Case 3. *Pleurisy after lifting a heavy weight; irregularity of the pulse and a bellows murmur at the heart; treatment by calomel, cupping, and blistering; recovery, with deficient expansion of left side.*—W. Thomas, aged 22, of rather spare habit, was admitted on the 17th of March. He had been at sea until a year previous, when he fell and injured his head. His intellect was deranged for some time after, and his sight continued impaired. He was employed in a flour shop until about a month before admission, when he injured his side by lifting a heavy weight. But before this, he had suffered from cough with some expectoration. Eight days ago the pain got worse, and he had a rigor. There is now pain in the left side of the chest and at the epigastrium on pressure. There is less motion in the left side during respiration, also slight dulness and diminution of the respiratory murmur. There is thirst, the tongue is dry, and the bowels constipated. The skin is not hot, but the pulse is very quick, small, and irregular. The action of the heart is very irregular, but no abnormal sound is perceived.

Eight ounces of blood to be taken from the side by cupping; five grains of calomel and five grains of antimonial powder to be taken immediately, and a dose of house medicine four hours after.

18*th.* The pain was relieved by the cupping; the pulse is now regular, 80. The medicine caused vomiting, and he has been

freely purged. There is expectoration of some frothy mucus. There is slight friction sound on the left side, and some subcrepitant and sonorous rattles. The dulness has not increased, and there is no aegophony.

A blister to be applied, and a pill of two grains of calomel and one third of a grain of opium to be taken every third hour.

19th. He seems rather better, but the blister has not yet risen, and there is still pain in the side, with troublesome cough and frothy expectoration. Thirst continues, but the pulse is only 78. Friction sound is no longer audible.

To have every fourth hour a draught consisting of half a drachm of antimonial wine, two drachms of solution of acetate of ammonia, and half a drachm of spirit of nitrous ether, with five drachms of camphor mixture.

20th. The cough is easier. Pulse 74. Gums not affected.

23d. There is still some fever, and slight pain in the side. Pulse 84. Tongue not clean, and rather dry. The calomel was omitted yesterday, but the gums do not seem to be sufficiently affected yet. There is considerable dulness at the lower part of the left side, and it moves to the most dependent part of the chest when the position of the patient is changed. Aegophony is now heard. The patient feels no palpitation of the heart, but its action is irgular, and there is a slight bellows murmur with the first sound.

A blister to be applied over the region of the heart, and the pills with calomel and opium continued.

24th. The gums are sore. The blister has risen, and the patient seems better. The pulse is 76, and the action of the heart is quite regular. The first sound has, however, a peculiar muffled character. Pills of calomel and opium to be omitted.

27th. There is decided improvement. The gums are still sore. The pulse is regular. There is no aegophony, and the dulness at the lower part of the left side is very slight.

3d April. The patient is going on favourably. He has been taking no medicine, except occasionally a tea-spoonful of a mixture of equal parts of the oxymel of squill and compound tincture of camphor for the relief of the cough. The gums are still slightly under the influence of mercury. The tongue is quite clean, and the appetite good. He is not entirely free from pain in the left side, and there is deficient expansion on full inspiration at the lower part, as if the lung were bound by adhesions. The sound on percussion is less clear than on the right side, and respiration, though free from rattles, is feebler than on the other. The resonance of the voice is natural. The first sound of the heart is to-day, for the first time, free from abnormal sound, and quite natural.

7th. He is quite well, though expansion is still deficient on the left side. Discharged cured.

Remarks.—The complication of the signs of endocardial inflammation with well-marked pleuritis is the chief point worthy of notice in this case. The pain at the epigastrium and in the left side might have been caused either by endocardial or pleuritic inflammation; but pain is a much less constant symptom of the former than of the latter. The first sign which induced a suspicion of endocarditis was the irregularity of the heart's action; and when to this was afterwards added the bellows murmur at the base of the heart, and the muffled character of the sounds, no doubt of its existence could be entertained. The two diseases required the same plan of treatment, with hardly any modification, and cupping, blistering, and the action of mercury on the system seemed to restore the heart to its natural condition, whilst they, at the same time, removed any fluid effused into the pleura. The deficient expansion which remained was no doubt caused by some adhesions. The cause of the endocarditis in this case is a point worthy of inquiry. It is a well ascertained fact, that, in the majority of cases, endocarditis arises from acute rheumatism, or in consequence of disease of the kidneys. Many cases of valvular disease of the heart cannot, however, be traced to either of these diseases, and the causes of such cases are still open for investigation. Some of them probably arise from attacks of endocarditis, induced by some of the common causes of inflammation, such as exposure to cold, and occur either alone, or, as in this case, in conjunction with inflammation of some part within the chest.

Case 4. *Pneumonia with jaundice.—Post-mortem examination.*—John Rowe, a stout sailor, aged 28, who had been in warm climates, was admitted, on the 19th of March, with cough and pain in the chest. He was slightly jaundiced. The tongue was furred, yellow, and the pulse small and quick. A blister was applied to the right side of the chest, and he was freely purged with calomel and antimonial powder and house medicine. On the following day the face was slightly flushed, the cough very troublesome, and the expectoration rusty. There was considerable thirst, and the pulse was 112, rather small; but the tongue was cleaner.

The physical signs were, dulness on percussion about the centre of the right lung posteriorly; bronchial respiration and crepitation in the same situation and lower down; and some subcrepitant and sonorous rales on the left side before and behind.

Twelve ounces of blood were taken from the arm without causing faintness, and a pill containing two grains of calomel, a sixth of a grain of tartar emetic, and a third of a grain of opium was given every fourth hour.

On the 21st he felt very low, and the pulse was 96, very weak. The expectoration was very abundant, red, and frothy, and there was rattling in the chest. The dulness at the lower part of the right side was complete. There was bronchial respiration over the centre of the right lung. Three ounces of wine were ordered, and also a stimulating mixture with carbonate of ammonia, chloric ether, and tincture of squill. In the evening, the quantity of frothy mucus in the bronchial tubes was so great as to threaten suffocation, and an emetic, with two scruples of carbonate of ammonia in two ounces of water, was given. This cleared away the mucus from the bronchial tubes, and he rallied surprisingly after it. The pills were continued without the antimony, and also the stimulating mixture. The mucus again accumulated in the evening, and, though the emetic was repeated, he died on the morning of the 23d March.

Inspection.—There was adhesion of the right *pleura*, partly recent and partly old; also very firm deposit of false membrane between the lower lobe and the diaphragm, and between the lobes of the lung, glueing them together. The lower lobe was in the third stage of inflammation, and of a whitish-yellow colour from infiltration of purulent matter. It had a granulated appearance, and was easily broken down. The middle lobe was in the first stage of inflammation, and was separated from the lower lobe by a white line formed by the lymph effused into the fissure. The left lung was gorged with blood, but not inflamed. The mucous membrane was very red.

The heart was healthy.

The liver was large, and of a yellow colour and nutmeg appearance. The gall-bladder contained extremely dark viscid bile, and a gall-stone of dark colour, and consisting of small granular aggregated particles. The spleen was large, and the kidneys were large and flabby.

Case 5. *Pleuro-pneumonia and bronchitis.—Post-mortem examination.*—C. Baker, a sailor, aged 26, was admitted on the 27th December 1847. He had been ill for a week, but had got much worse the two last days, and had been bled the day before he was admitted. He had agonizing pain in the right side about the cartilages of the ribs, which impeded his breathing so much that it was thought he had diaphragmatic pleurisy. The face was slightly flushed, and the pulse 120, small. The tongue furred. Sibilant rale was heard on both sides of the chest. At the lower part of the right side the respiration was feeble, and the sound on percussion rather dull. Ten leeches were applied with considerable relief, and he took every fourth hour a pill trium, and the pulse was 90. The pills with hyoscyamus and digitalis were repeated, and twelve leeches were applied. The leeches entirely removed the pain, and on the 16th two tablespoonfuls were given thrice a day of a mixture consisting of two drachms of tincture of foxglove, four drachms of tincture of henbane, and twenty-four minims of dilute hydrocyanic acid, in seven ounces and a half of water.

On the 18th he was in every respect better. His pulse was 84, and he had slept well. He continued much the same till the 6th September, when he had more oppression at the chest, requiring the application of six leeches, which relieved him. On the 13th there was some œdema of the ankles, and he was much worse. The swelling increased, and on the 17th the pulse was 112. Compound powder of jalap was given with bitartrate of potass and calomel, and every night half a grain of muriate of morphia. Diuretics with squill and digitalis, and elaterium as a purgative, failed to remove the dropsical swelling. Some relief from the oppression was experienced from dry cupping, but the swelling increased, and he died on the 4th October.

Inspection.—The heart was very large; both ventricles being dilated, especially the left, and the walls somewhat thicker than natural. One of the semilunar valves of the aorta was thickened and contracted, and at the centre it was perforated by a round hole. The other two were also somewhat thickened. Parts of the interior of the aorta were rough and thickened from lymph having formerly been deposited. The mitral valve showed some traces of old inflammation, but was in other respects healthy. There were some old adhesions of the pleura on both sides.

The liver was yellowish and congested. The other organs were healthy.

Case 6. *Disease of the heart with pulsation at the origin of the aorta; dropsy; great relief from diuretics and purgatives.*—J. Williams, a servant, 30 years of age, residing at Woolton, was admitted on the 12th November 1846, with the lower extremities enormously swelled with dropsy. She stated that her illness had commenced three months previous, and that she had when walking to church been suddenly seized with sickness and faintness, immediately after which she began to swell; but it appeared that before this she had been subject to winter cough, shortness of breath, and palpitation. She had a pale, unhealthy appearance, the surface was cold, and the pulse quick and small. She scarcely suffered from palpitation. There was more dulness on percussion than natural in the region of the heart; the impulse was increased in force and extent, and slight vibration could be felt when the hand was applied to the base of the heart. A loud murmur was heard in this situation with the first sound.

She was ordered to take twice daily one scruple of compound jalap powder, one drachm of bitartrate of potass, and two grains of calomel; and three times daily one ounce of a mixture containing one drachm and a half of tincture of squill, one drachm and a half of tincture of foxglove, two drachms of acetate of potass, and four drachms of spirit of nitrous ether in seven ounces of water. She continued the powders till five had been taken, when they were stopped, as the calomel had affected the gums. She got rapidly better, and on the 19th there was no swelling of any part, no oppression, and the impulse was much diminished. The pulse was 78. On the 23d the murmur was heard in the situation of the aortic valves, and upwards along the sternum one inch and a half. A blister was applied, and another powder given. On the 25th the patient continued better, the mixture was stopped, and a pill containing one grain of digitalis and four of extract of hyoscyamus given thrice a day. On the 27th the pulse was 62, and the next day 92, but she felt equally well both days.

On the 2d December, in examining at the level of the third rib, it was found that there was vibration and stronger pulsation than at the apex of the heart, and it was thought, therefore, that there was some aneurismal dilatation of the aorta. On the 12th December, she felt so well that she wished to leave the hospital. She had then no swelling or palpitation; and the impulse of the heart had been much reduced by the mixture and pills which she had taken.

Case 7. *Aneurism of the thoracic aorta and dropsy, relieved by diuretics and aperients.*—M. Carroll, a widow, aged 56, was admitted on the 29th of May, with dropsy of the lower extremities and palpitation. She traced her illness to a fall four years before, and ever since had suffered from palpitation and shortness of breath, when she took cold. Three weeks before admission she caught cold in the chest, and the legs began to swell. She had a pale debilitated appearance, and the hands were dusky and livid. The pulse was regular and strong. There was some prominence at the upper part of the sternum. A thrilling sensation was felt on applying the hand to this part, and on pressing the fingers behind the sterno-clavicular articulation, a pulsating tumour was felt. There was dulness on percussion over the upper part of the sternum, and the cartilages of the ribs on each side. A loud double aneurismal murmur, corresponding with the two sounds of the heart, was heard along the upper half of the sternum, and on each side. There was a murmur over the aortic valves with both sounds. The patient was treated with castor oil as an aperient, and with a diuretic mixture, containing tincture of squill and digitalis, acetate of potass, and spirit of nitric ether. The swelling of the legs rapidly disappeared, and the palpitation and shortness of breath were relieved. Ten minims of tincture of digitalis were then given, with three of hydrocyanic acid, thrice a day; and, after being ten days in the hospital, the patient went out so much relieved, that she would scarcely believe that the disease still remained.

Case 8. *Aneurism of the left ventricle of the heart, with dropsy and physical signs resembling those of mitral insufficiency; dropsy removed by diuretics; sudden death.—Inspection.*—W. Henderson, a man of large frame and dark complexion, aged 28, a joiner, was admitted on the 11th October. He said that he had been ill for four months, and unfit for any work for three. His illness commenced with palpitation and shortness of breath. He was not, however, aware of any cause for it except that his habits had been very intemperate, and that he had taken mercury for syphilis seven years previous. The face was swelled, and the conjunctiva had a dirty yellow colour. The legs were enormously distended with fluid, and the abdomen and right hand were also swelled. Dyspnœa was so great, that he could not lie down. The urine was scanty, but not albuminous. The pulse was small and very weak. The sounds of the heart were duller than natural, and the impulse was increased. A very distinct murmur was audible towards the apex of the heart, such as is heard in cases of insufficiency of the mitral valve; but it was traced more to the left side than in cases of this valvular lesion. There was dulness at the lower part of the right side of the chest, and fulness and hardness in the situation of the liver. Respiration was obscured by some sonorous and mucous rales. A pill, consisting of three grains of blue pill, one grain of squill, and one grain of foxglove, was given twice a day. An ounce of the following diuretic mixture was also given thrice a day: four drachms of spirit of nitrous ether, one drachm and a half of tincture of squill, two drachms of acetate of potass, and seven ounces and a half of the decoction of broom-tops.

These medicines acted powerfully upon the kidneys. The swelling went rapidly down, and the dyspnœa diminished. On the 13th, the pills were given only once a day, and half a drachm of compound jalap powder at night. On the 15th, the pills were stopped altogether, as the gums were a little tender. There was still much dyspnœa, and half a grain of muriate of morphia was ordered to be taken at bed-time. On the 19th, he died suddenly after a fit of coughing.

Inspection.—The œdema had almost disappeared. The left pleura contained nearly a pint of serous fluid. There were adhesions on the right side, and the right lung was infiltrated with serous fluid. At the apex there were a few rounded bodies the size of currants, of grayish colour, but tougher and less firm than tubercles. The lower part of the lung was in a state of chronic inflammation, solidified, tough in its structure, and of a bluish-gray colour.

The *pericardium* was everywhere adherent, and the heart appeared large, broad, flat, and filled with blood. On removing it, a part was ruptured, and clots of blood evacuated from what appeared to be a dilated left auricle; but on further examination it was found to be a large aneurism lying along the left side of the left ventricle. Its walls were formed by the two adherent folds of the *pericardium*, thickened by fibrinous deposits. The internal surface was rough, and of a yellowish colour. The sac communicated with the left ventricle by an opening capable of admitting the point of the little finger. It was situate close to the auriculo-ventricular opening, and partially covered by the mitral valve. The edges were smooth and rounded.

The liver was very large and had a porphyritic appearance. The kidneys were large from simple congestion, and the spleen was rather large.

Remarks.—In this case, of one of the rarest forms of disease of the heart, the symptoms, progress, and termination were similar to what have been recorded in the majority of cases of aneurism of the heart. Mr Thurnam has shown in a paper published in the Medico-Chirurgical Transactions (vol. 21, 1838), that aneurism may affect any part of the walls of the left ventricle, but most frequently the apex, and next to this the base of the ventricle; the part which yielded to the distending force in this instance. Dr Craigie has also recorded, in a paper containing some interesting observations on aneurism of the heart, published in the 59th volume of the Edin. Med. and Surg. Journal (1843), a curious case in which the aneurism was situated in the *septum* between the ventricles. Though this disease has frequently proved fatal suddenly, it would seem that rupture of the sac into the pericardium or pleura has occurred in only a small proportion of the recorded cases.

It appears doubtful if this disease has ever, during the life of the patient, been accurately distinguished from other affections of the heart; and in the case related it was thought that, in addition to hypertrophy with dilatation, there was insufficiency of the mitral valve. The swelling from dropsy prevented an accurate examination by percussion, otherwise there can be no doubt that much increase of dulness would have been discovered to the left of the heart in the situation of the aneurism. A very distinct murmur was heard at the apex during the systole, which led to the diagnosis of insufficiency of the mitral valve; and when an examination was afterwards made, it was found that the opening was not only situated close to this valve, but also admitted of the same flow of blood backwards, which would have arisen from imperfection of the mitral valve, but with this difference, that it flowed into the aneurismal sac instead of the left auricle. The murmur could, however, be traced more directly to the left side and less downward from the apex than in cases of mitral disease.

Scurvy.—There were 14 cases of sea scurvy in 1846, two of which died, and 13 in 1847, three of which died. In the spring and summer of the latter year, we had, in addition to the cases of sea scurvy, 17 of land scurvy, one of which proved fatal. This disease, which occurred as an epidemic in most parts of Great Britain and Ireland in the spring of 1847, in consequence of the failure of the potato crop, scarcely differed at all from the form of the disease which occurs at sea; and I had therefore no difficulty in recognising the first case, which came under my care in the beginning of April. The disease is the same wherever it occurs, and is characterised by paleness, debility, pains in the limbs, and stiffness of the joints, dark spots and discoloured swellings of the legs, and soreness and swelling of the gums. The following was one of the severest cases of sea scurvy I have seen recover.

Case of Sea Scurvy.—F. Ellams, aged 21, was admitted on the 12th October 1847. He had sailed from Monte Video on the 17th July in the Caroline, 280 tons burden, with eleven hands, six of whom had scurvy. He had been ill six weeks. The crew had plenty of provisions, and one bottle of lemon juice was given weekly among eight men. The ship had no iron water tank.

He had a pale yellow colour, the pupils were dilated, and he was so weak as to be in danger of fainting when raised in bed. The pulse was 126. The gums were very sore, of a livid red colour, very fungous, and in a state of suppuration. There were small red spots on the legs and thighs, a blue swelling on the right tibia, and stiffness and swelling of the knee with induration in the ham. He was treated with two lemons a-day, two eggs, beef tea, potatoes and milk, and he took a single dose of castor oil. His appetite was good, and he rapidly recovered. On the 15th his pulse was 116. On the 21st, the gums had a red colour, and were much less swelled. There was still, however, induration in the ham and stiffness of the knee, for which turpentine liniment and a warm bath were ordered.

The researches of Liebig have rendered it extremely probable that our food is of two kinds, and must serve one of two purposes. It is either proteinaceous, consisting of animal or vegetable fibrin, albumen, or casein, and suited to take the place of the worn-out tissues of the body; or it is saccharo-farinaceous, and capable only of furnishing carbonaceous fuel for respiration. A deficiency in the quantity or bad quality of either of these important kinds of nutriment will no doubt tend to induce scurvy; but the essential cause is the want of the vegetable acids contained in many of the cruciferous plants, such as the cabbage; in most fruits, such as the orange, but especially the lemon; and in some roots, such as the potato. Previous to the late epidemic of scurvy, the value of the potato in preventing the disease in prisons had been made known by Dr Baly, and its value at sea by Dr Dalton and Mr Bernacastle. Until towards the middle of last century, scurvy was a common disease in the spring and early part of summer in all the northern parts of Europe. It ceased about this time to be commonly met with on land; and it is worthy of remark, that though the potato had been introduced into this country towards the end of the preceding century, it did not come into general use till this period. It continued to commit dreadful ravages in our navy at sea, until the end of last century, when lemon juice was regularly served out, and improvements effected in the victualling, by which scurvy was almost completely eradicated. It still, however, occurs to a greater extent in the merchant service than it ought to do, if proper attention were paid to its prevention; and, from a calculation I have made, I believe that about 100 cases are landed annually at this port. Scurvy having been eradicated from the navy, there can be no doubt that it might be banished from the merchant service also, if the same attention were paid to the provisioning of the latter. In the navy, one ounce of lemon juice with sugar is served out daily, and half a pint of vinegar weekly, to each man when on salt provisions. The last seamen's act provides that these antiscorbutics should be given in the merchant service too, but half instead of one ounce of lemon juice. It seems questionable if half an ounce be a sufficient quantity on long voyages. The provisions in the navy are always of the best quality, and there is a fixed scale of diet. We can scarcely suppose that they are uniformly of as good quality in the merchant service; but if they should ever be of decidedly bad quality or deficient in quantity, the seamen are not without a remedy, as any three of them can cause a survey to be made. Seamen in the merchant service require a fuller diet than in the navy, having harder work; but there is no fixed scale of diet as in the latter, the quantity of provisions being made the subject of an agreement between the master and the seamen. Dr Wilson* has attributed much of the improvement in the health of the navy to the universal use of iron tanks for the preservation of the water, and they are coming into general employment in merchant vessels also. The superior attention paid in the navy to ventilation and cleanliness must have some influence in preventing scurvy, as we know that everything which contributes to sound health tends to the prevention of this disease.

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* Statistical Report of the Health of the Navy, printed by order of the House of Commons.

I would, then, with the view of eradicating this disease from the merchant service, press upon the consideration of those who exercise any control in the provisioning of ships for distant voyages the following points:—

1st. Strict attention to the quality of the provisions, and the use of vegetables to vary the diet whenever they can be procured.

2d. The adoption of the naval scale of diet as a minimum beneath which the quantity should never fall.

3d. The use of potatoes whenever they can be procured.

4th. The substitution of iron water-tanks for water-casks.

5th. The adoption of as strict attention to ventilation, cleanliness, and other hygienic means employed in the navy, as is consistent with the merchant service.*

VI. Diseases of the Stomach and Intestinal Canal.

An epidemic of diarrhœa and dysentery extended over a great part of both the years embraced in this Report, and rendered diseases of the stomach and intestinal canal the most numerous class in 1846; the total number being 154; and in 1847 the number of cases was still large, being 98. Bowel complaint became very common in June of the former year, and in autumn assumed generally the form of dysentery. The cases diminished in number about the beginning of November, and towards the end of December they almost ceased; but a very considerable number of cases of diarrhœa and dysentery, many of them of a very severe and intractable description, were met with during the whole of 1847.

The following is the number of cases of dysentery admitted in each month of 1847:—January, 6; February, 5; March, 16; April, 8; May, 3; June, 3; July, 6; August, 13; September, 5; October, 4; November, 5; December, none; total, 74.

The chief remedies which I have used in the treatment of this disease have been the application of leeches and the warm bath, in some cases, in an early stage; opium, with small doses of calomel several times a-day; and in slighter cases, mercury with chalk and Dover's powder; occasional aperients during the whole course of the disease, consisting of from two to four drachms of castor-oil with acacia mixture, and ten or fifteen minims of laudanum; and enemata, with forty minims or a dram of laudanum, and about two ounces of starch, to which from six to twelve grains of acetate of lead were often added. The enemata were repeated according to the severity of the disease when they were found of service; but in many cases they could not be borne at all. As external applications turpentine fomentations were very useful, and at a later period blisters. During the decline of the disease astringents were useful; and chalk-mixture, with aromatic confection, laudanum, and ipecacuan, or, instead of the ipecacuan, tincture of catechu was often given. In the chronic stage, acetate of lead or sulphate of copper were prescribed with opium; or a tonic mixture with infusion of cusparia; or decoction of cinchona, with laudanum and aromatic confection, and sometimes with nitric acid.

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* See Observations on Scurvy by the author. Lancet, 29th April 1848.

Case 1. *Dysentery treated by leeches, the warm-bath, calomel, with opium and a blister, subsequently by opium and by balsam of copaiva.*—Abner Rogers, a stout American mulatto seaman, aged 23, was admitted on the 9th of August 1847, having been ill with dysentery about ten days. He had lost all appetite, was thirsty, and his tongue was covered with a thick yellow coat. The pulse was only 70. There was considerable tenderness of the abdomen on pressure, and the motions were abundant, consisting of a brown fluid mixed with blood. There had been fifteen during the previous night. He was ordered to have twelve leeches applied, a warm-bath afterwards, and one grain of opium with two of calomel every fourth hour. He was greatly relieved by the leeches and bath; and the next day the tenderness had gone, and the tongue was less thickly coated. He went out, however, to get his clothes, as his ship was going to sail, and this threw him back. On the 12th there was great prostration of strength; the pulse was 60, and the motions consisted of blood mixed with membranous shreds. The tongue was much coated. The pills with calomel and opium were continued, and an enema with starch and laudanum given. On the 13th he seemed very weak. The pulse was 62, the tongue loaded, and the gums slightly affected by the calomel. There was no tenderness, and the motions consisted chiefly of bloody mucus. The enema had caused great pain. A suppository, with two grains of opium and six of plaster of lead, and a blister to the abdomen, were ordered. The calomel and opium were stopped, and two ounces of wine given daily. On the 14th there was much straining, and the motions were dark and fœculent. The tongue was furred, the pulse 60, and there was much prostration of strength. The wine was increased to three ounces, the suppository repeated, and a draught given containing two drachms of castor oil and six drachms of gum arabic mixture, with ten minims of laudanum in one ounce of peppermint water.

On the 16th there was still much straining; but the motions were feculent and without blood. The draught was repeated, and two grains of opium given every sixth hour. On the 18th he complained of much pain at the anus and prolapsus. A lotion with laudanum and acetate of lead was used, but without any benefit. On the 19th the motions consisted of mucus, with some feculent matter. The opium was continued, and two tablespoonfuls given of a mixture containing two drachms of balsam of copaiba and two ounces of mucilage of gum arabic in six ounces of cinnamon water. Great benefit was derived from this mixture, and the pain at the anus was relieved by the warm hip-bath. On the 4th September he was much better, and the tongue was quite clean. He had still, however, some pain in the rectum. On the 6th the mixture was laid aside, as it caused some sickness; and on the 10th September he was discharged cured.

Case 2. *Dysentery treated by calomel and opium, aperients, and astringents.*—A middle-aged man was taken ill four days before admission, while on board a vessel in which he had intended to have gone as an emigrant to America, with severe purging, and was admitted on the 10th of April. Two grains of calomel with one of opium were given every third hour. The next day he had pain in the bowels, and the motions were still very frequent and fluid, but without blood. The pills were continued; and an enema given with starch and forty minims of laudanum. On the 12th he was better, and had felt comfortable after the enema, but the bowels were still loose. The tongue was reddish at the sides and streaked at the centre. The gums seemed swelled, but were not sore. The enema was continued twice daily; the calomel and opium omitted; and a draught given with two drachms of castor oil, acacia mixture, peppermint water, and ten minims of laudanum. On the 13th he was considerably better. There was still much looseness, but no tenderness of the abdomen on pressure. He was directed to take three times daily one ounce of a modification of the chalk mixture, consisting of eight grains of ipecacuanha, two drachms of aromatic confection, one drachm and a half of laudanum, and eight ounces of chalk mixture.

On the 14th it was found that he had been greatly relieved by the mixture. The pulse was 80; the tongue still red at the sides, and slightly furred at the centre. On the 19th there had been more diarrhœa; the tongue was rather dry, and the throat sore. Five grains of mercury with chalk, and five of Dover's powder were given, and the aperient draught with castor oil was repeated four hours afterwards. On the 21st he was much better; the bowels had been only twice open in the night, and once in the day, and the tongue was clean and moist. On the

28th he was so much better, that the chalk mixture was stopped. On the 30th the tongue was clean and the appetite good, but the bowels were still loose. A mixture with decoction of cinchona, aromatic confection, and laudanum was given, which completely stopped the looseness; and on the 10th of May he was discharged cured.

Case 3. *Dysentery treated with turpentine, aperients, &c.*—Thomas Abott, mate of a ship, aged 28, was admitted on the 29th of November 1847, with severe purging of blood, from which he had suffered for a fortnight. The tongue was covered with a thick yellow coat; he had thirst, and no appetite; the skin was hot, and the pulse above 100; the bowels were open about four times a day, and the motions were almost entirely blood, but he had very little pain or straining. He was directed to take every fourth hour one ounce of a mixture consisting of two drachms of oil of turpentine in two ounces of the mucilage of gum arabic, and four ounces of cinnamon water.

There was but little change the following day. The tongue was still yellow and furred; the pulse 98, rather small; and the skin hot. The bowels had been open three times. An enema, with a drachm of laudanum, six grains of acetate of lead, and two ounces of starch, was given; and on the 1st December he was better, and the motions did not consist of blood, but were fluid, and of a brown colour. The tongue was still furred. Three grains of mercury, with chalk, and six of Dover's powder, were given at bed-time; and next morning a draught containing two drachms of castor oil, with laudanum, acacia mixture, and cinnamon water.

On the 3d he was much better. The tongue was nearly clean; the pulse 88; and there was no blood in the motions. The mixture with turpentine was now stopped, and the mercury, with chalk and Dover's powder, given thrice daily.

On the 6th he was still improving, but the bowels continued open thrice a day. Chalk mixture, with ipecacuan, laudanum, and aromatic confection, was prescribed, and had the effect of entirely stopping the looseness.

On the 20th December he was able to leave the hospital quite well.

Case 4. *Obstinate dysentery treated with the usual remedies in the early stage, and benefited in the chronic by sulphate of copper with opium, and by decoction of cinchona with nitric acid and laudanum; afterwards dropsy removed by the compound spirit of juniper and squill.*—B. Gilbride, a delicate girl, 20 years of age, was admitted on the 23d of July 1847, having been ill with dysentery for nine days. She had some soreness of the abdomen on pressure; thirst; furred tongue; and pulse 126.

Six leeches were applied to the abdomen, and one grain of opium was given with two grains of calomel thrice a day.

On the 24th she seemed better, and had been relieved by the leeches. The tongue was cleaner; the pulse 104; and the skin cool. The motions were of a light colour, and mixed with blood. The pills, with calomel and opium, were continued; turpentine fomentations were applied, and an enema, with forty minims of laudanum, administered twice a day.

On the 25th she appeared to be improving, and had been relieved both by the fomentations and the enemata. She had no appetite, but the tongue was nearly clean; there was less thirst, and the pulse was 100. The bowels were very frequently open, and the motions consisted of a reddish fluid mixed with shreds of lymph and a small quantity of fœculent matter. A draught, with three drachms of castor oil, and fifteen minims of laudanum, and acacia mixture, and cinnamon water, was given; the pills were stopped, but the fomentations and enemata continued.

On the 26th the motions were bilious and fœculent, large, fluid, and streaked with red. The draught had caused no pain in the bowels; the pulse was 98; and there was no pain on pressure. Chalk mixture, with laudanum, aromatic confection, and ipecacuan was given every fourth hour.

On the 27th, instead of the enemata, which caused much pain, a suppository, with two grains of opium, was ordered to be administered every night. This treatment was continued with apparent benefit, and the castor oil draughts repeated twice, until the 31st, when a blister was applied, as she seemed not quite so well. She appeared decidedly better, in consequence of the vesication from the blister; and on the 2d August, the tongue, though rather red, was clean, and there was some appetite. The bowels were also less frequently opened. From this time till the 7th she made no improvement. Enemata, with acetate of lead, laudanum, and starch, were tried, and a second blister applied. Acetate of lead, with opium, was also given internally; but no very decided benefit resulted from these means.

On the 16th she was still very ill, being much purged, and having also sickness and vomiting of a bluish-green fluid. The feet were also swelled. Pills, with sulphate of copper and opium, of each half a grain, were now given; and the proportion of the former was afterwards increased to one grain. These pills were of some service in checking the looseness, but the vomiting was very little relieved by hydrocyanic acid in infusion of cusparia. The warm hip-bath gave her considerable relief.

On the 1st of September she was still, however, very ill, and much reduced by the long continuance of the disease, which must have induced ulceration of the large intestines. An ounce of the following mixture was ordered thrice a day, and produced most decided benefit:—Dilute nitric acid, one drachm and a half; tincture of opium, one drachm and a half; decoction of cinchona, eight ounces.

On the 4th there was some tympanetic distension and pain in the abdomen, and the motions had the appearance of a reddish jelly, mixed with some fœculent matter. Ten grains of Dover's powder were given at bed-time, and continued every night. Under the use of this and the acid mixture she steadily improved. Her legs and the whole body gradually swelled more as the looseness of the bowels diminished, and the dropsy seemed to be caused simply by debility, as the urine contained no albumen, and the sounds of the heart were natural. The potassio-tartrate of iron was tried, but without any benefit.

On the 11th a warm bath was given; and on the 12th a pill containing blue pill, squill, and digitalis, but it could not be continued, as it acted upon the bowels.

On the 15th a drachm of tincture of squill was mixed with an ounce of compound spirit of juniper. Of this a teaspoonful was taken thrice a day, and acted well upon the kidneys. The swelling disappeared, and on the 17th of November she was able to leave the hospital.

Remarks.—This was one of the most obstinate and tedious cases of dysentery which has come under my care; and I have no doubt that the slowness of the patient's recovery was owing to ulceration having taken place; for in all the fatal cases which I had an opportunity of examining, where similar symptoms had been present, extensive ulceration was found in the colon and rectum.

VII. Dropsy from Disease of the Kidneys.

On referring to the table it will be seen that the number of cases of dropsy was considerable during both years.

Our knowledge of the diseases of the kidney, which induce dropsy, has been rendered much more precise by the light lately thrown upon their pathology by Simon, Johnston,* and other microscopic observers, by the latter of whom it has been shown that the forms of dropsy, known as acute and subacute, and that from chronic (Bright's) disease of the kidney, in all of which albumen is usually found in the urine, are produced by four conditions of the kidney, to which he has given the names of acute desquamative *nephritis*, chronic desquamative *nephritis*, simple fatty degeneration, and a combination of fatty degeneration, with desquamative *nephritis*. No new remedy for the treatment of these diseases has been pointed out; but improved knowledge of the pathology of these diseases must give us greater precision in the use of those which we possess. While it shows forcibly the importance of healthy digestion and assimilation, and activity of the cutaneous functions in preventing the early progress of these diseases; it also points out the necessity of removing inflammatory congestion by depletion, and in the treatment of this form of dropsy of exciting increased action of the skin and bowels, rather than of the kidneys by stimulating diuretics.

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* Medico-Chirurg. Trans. vol. 29 and 30.

Case 1. *Subacute dropsy with bronchitis and diarrhœa, much benefited after the removal of the complications by the preparations of iron.*—Thomas Hayden, a labourer, aged 21, who appeared to have suffered much from poverty, was admitted on the 28th of April 1848, with the whole body much swelled. A warm bath was ordered for him, and some compound powder of jalap. It was difficult to obtain any precise information from him, but the following day he stated that he had been ill for a fortnight. The skin was cool, rough, and dry, and as it was in a state of desquamation, and the throat was also sore, it was thought that he might have had scarlet fever. It could not, however, be ascertained whether he had had this disease or not. The tongue was red at the point, and he was thirsty. The bowels had been freely opened by the powder, and the swelling had subsided. He had severe cough, and sonorous, sibilant, and mucous rattles were heard in every part of the chest. The urine was scanty, high coloured, and albuminous, specific gravity 1025. He was cupped over the loins, a warm bath was given, and a blister applied to the chest.

On the 30th the swelling was rather less, but in other respects he had not improved. The pulse was only 56, and the cough more troublesome. There was thirst and redness of the edges of the tongue. Another warm bath was ordered, and a diuretic pill was given thrice a day, containing three grains of blue pill, and one each of squill and digitalis. A draught with ten grains of nitrate of potass, a scruple of acetate of potass, and a drachm of spirit of nitric ether, was also given thrice a day. These medicines acted upon the bowels, but scarcely at all upon the kidneys. On the 3d of May the face was much swelled, and the bowels loose. The urine was not albuminous, but contained a sediment which was dissolved by nitric acid. Five grains of Dover's powder were given thrice a day, and the other medicines stopped. The patient was still very much purged on the 8th, and an astringent mixture with catechu, laudanum, and chalk mixture was given.

On the 10th he was better, and the respiration was nearly free from rattles; but the urine was slightly albuminous, high coloured, and of specific gravity 1025. He was still considerably swelled. He continued taking the astringent mixture till the 19th, when half a drachm of the syrup of iodide of iron was given thrice a day in water.

On the 22d it was found that the diarrhœa had returned. The swelling had abated, but he was weak and emaciated. A grain of opium was given every fourth hour, and had a most beneficial effect, the diarrhœa being completely stopped by it. It was continued till the 27th, when ten grains of the potassio-tartrate of iron were given thrice a day. From this time he rapidly recovered, and improved in colour, and gained flesh.

On the 4th the urine was without albumen, and there was only slight œdema in the feet. The potassio-tartrate of iron was increased to one scruple thrice daily.

On the 14th he was discharged cured.

Case 2. *Acute dropsy treated by bleeding, the warm bath, purgatives, and diuretics.*—P. Hart, a stout labourer at the docks, aged 24, was admitted on the 17th of June, with general dropsy. He had been heated thirteen days before with carrying salt, and the same evening he felt cold, and soon after cough came on, and he began to swell. Before this, however, he had observed slight swelling of the eyelids, but he had always enjoyed good health, and according to his own account had not been intemperate.

The legs and the whole of the body were much swelled. The tongue was nearly clean, but there was thirst and loss of appetite. The skin was rather hot, and he had not perspired since he had taken cold. The pulse was scarcely quicker than natural. He had been sick, and had vomited, and there was tenderness on pressure of the right kidney. The urine was albuminous; specific gravity 1020. There was cough, with shortness of breath, and the respiration was obscured by sibilant rale. About twelve ounces of blood were taken from the arm, a warm bath was given, and a powder containing two scruples of compound jalap powder, two grains of calomel, and half a drachm of bitartrate of potass. He was relieved by the bleeding and bath, and perspired freely afterwards. The next day it was found that the blood was buffed. The swelling of the legs had greatly diminished, and there was no tenderness on pressure of either kidney. The urine was still albuminous. The bath and powder were repeated, and the following diuretic mixture prescribed:—one drachm of nitrate of potass; two drachms of acetate of potass; two drachms of tincture of foxglove; six drachms of spirit of nitrous ether; and seven ounces of camphor mixture. Of this he was to take one ounce three times daily.

On the 21st he was much better. The quantity of urine was increased, and there was no swelling except about the neck and below the jaws. The pulse was 76, and there was no thirst, but the appetite was still indifferent. The powder was given again, and the mixture continued.

On the 23d the urine was very slightly albuminous, of specific gravity 1018. In other respects he was almost perfectly well, and on the 26th June he wished to be discharged.

Case 3. *Secondary syphilis and dropsy, with albuminous urine, treated with iodide of potassium, the warm bath, purgatives and diuretics, and with iodide of iron; patient dismissed with symptoms relieved, and readmitted two years after with influenza, but without the previous diseases.*—A woman, aged 25, a servant, was admitted on the 10th December 1845, with a large pustule on the side of the head. She had also an ulcer upon the lower lip, and another at the inner edge of the right eyelid, as well as a node upon the right clavicle. She had suffered from primary symptoms five years before; and in April preceding, having had sore throat, she was subjected to the action of mercury for nearly three months. Five grains of iodide of potassium were given thrice a day in compound decoction of sarsaparilla. Under this treatment she improved rapidly in appearance and strength, and the sores healed.

On the 30th of December it was found that there was considerable œdema of the legs. She stated that it had first appeared in June after getting the feet wet. The urine was found to be highly albuminous.

On the 31st iodide of potassium was given with spirit of nitric ether in infusion of gentian, and a warm bath was ordered. Her appetite became very good, and her general health improved under this treatment.

On the 3d the bowels were costive, and a scruple of compound jalap powder with a drachm of bitartrate of potass and two grains of calomel was given twice a day. The mouth was slightly affected after taking four of the powders.

On the 10th the iodide of potassium was laid aside, and a diuretic mixture, with squill, digitalis, acetate of potass, and infusion of quassia, was prescribed. The quantity of urine was increased, and the swelling in the legs diminished, but did not disappear.

On the 14th, half a drachm of syrup of iodide of iron was given thrice a day in infusion of calumba, and under the use of this she altered remarkably in appearance, and gained flesh and colour. The warm bath was also occasionally used, and also purgatives with elaterium and compound powder of jalap.

On the 23d of February, when she left the hospital, she was greatly improved in health and free from all secondary symptoms, but the urine was still albuminous, and there was œdema of the legs. I again saw her in May, and she was then stout and healthy-looking; but there was œdema of the legs, and the catamenia were scanty and irregular.

She was readmitted on the 8th December 1848 with influenza. She had the physical signs of pneumonia of the lower part of the right lung, and of bronchitis of both. Her appearance was then healthy, she had no swelling of the legs, and the urine contained no albumen. She was treated with the ordinary remedies, and on the 19th December was discharged cured.

Remarks.—The influence of secondary syphilis in causing disease of the kidney and dropsy has not been overlooked by Rayer, who details three fatal cases, and observes that most of those which arise from this cause are complicated with disease of the liver, and that therefore few of them recover. In this case, the patient, who was admitted in a state of extreme emaciation, derived great benefit from iodide of potassium and iodide of iron, assisted by purgatives and occasional warm baths; and we seldom see recovery from dropsy with disease of the kidney more perfect than it ultimately became. It is worthy of remark that, when dropsical, she was very easily affected with mercury given as a purgative, but she was by no means so sensible of its action when readmitted with influenza and pneumonia.

Two fatal cases of dropsy from disease of the kidney are worthy of being noticed. In one, the patient died from acute bronchitis and pericarditis. The bronchi were found intensely red, and filled with frothy mucus; the pericardium was rough from a deposit of lymph in small granulations. The heart was enlarged, and the valves slightly thickened. One kidney was large, full, and irregular in shape, with some of the tubular portions destroyed. The other was smaller; and when the capsule was removed, presented distinct white granulations.

In the other case, the patient was admitted in a very emaciated condition, and died with the worst symptoms of dysentery. The kidneys were large, and in both, the cortical portion was of a pale-yellow colour, while some of the tubular portions were obliterated.

The liver was large and granular, and it contained many firm tubercular bodies varying in size from a pea to that of a small nut. The pancreas was large and indurated.

The large intestines contained many small ulcers, which varied from a size smaller than a split pea to that of a fourpenny piece.

There was a cretaceous tubercle at the summit of the right lung, and there was a long band of adhesion between the heart and pericardium.

VIII. IRREGULAR MENSTRUATION AND AFFECTIONS OF THE OVARY.

1. *Case of advanced chlorosis, with fainting, vomiting, and dropsy of lower extremities, treated with the preparations of iron, &c.*—M. M'L., a servant, 25 years of age, was admitted on the 2d July 1847. She had not been in good health for a considerable time, and had not menstruated for three months. She was extremely pale, the face had a puffy appearance, and the lips were colourless. The legs were œdematous and she had pain in the right calf, on examining which, a knotted cord, produced by enlargement of the lymphatic glands, was felt. She had pain and noises in the head—giddiness and dimness of sight. She had also frequently fainted. There was a very loud continuous murmur in the veins of the neck. She had palpitation of the heart. The tongue was pale, large, and flabby, with a slight fur on each side. She had severe pain at the stomach after food, and sometimes vomiting. The bowels were costive.

She was ordered to have three times daily a pill consisting of one grain of sulphate of iron, one grain of aloes, and one grain of extract of henbane; and one ounce of a mixture containing twenty-four grains of sesquicarbonate of ammonia and sixteen minims of dilute hydrocyanic acid in eight ounces of infusion of calumbo.

The patient immediately began to improve in appearance. On the 7th the appetite was better, and she had no pain at the stomach. She had still, however, palpitation and giddiness, and disposition to faint when she assumed the erect posture. The quantity of sulphate of iron was increased to one scruple in twelve pills. On the 12th it was found that the bowels were too much opened by the pills. They were therefore laid aside, and, instead of the mixture of sesquicarbonate of ammonia and hydrocyanic acid, she was directed to have three times daily one ounce of a mixture containing two drachms of citrate of iron, and one ounce of tincture of cascarilla, in the eight ounces of infusion of calumbo.

On the 16th she had an attack of diarrhœa, which was checked by chalk-mixture, aromatic confection, and laudanum; and on the 19th she resumed the citrate of iron. On the 31st she was greatly improved in health and appearance. The venous murmur was less loud. She had a much better colour, and was free from all the symptoms with which she came into the hospital. On the 2d August she wished to leave the institution.

On the 18th of October she was readmitted in as bad a condition as when she first entered. She had general dropsy, giddiness, vomiting of her food, palpitation, and extreme paleness and debility. There was loud venous murmur. The sounds of the heart were loud and clear, and a slight murmur was heard with the first sound, which was thought to be anæmic. The urine contained no albumen. The catamenia had been once present soon after leaving the hospital. She was again treated with a mixture and pills similar to what had formerly been given, but the pills acted too much upon the bowels, and on the 25th an ounce of the compound mixture of iron was given thrice a day. The dropsical swelling disappeared, and she improved under this treatment in appearance and strength. On the 2d of November the symptoms referable to the head, the heart, and the stomach were all much relieved; and though warned of the danger of their returning from discontinuing the treatment, she wished to be dismissed, as she feared she would lose her situation.

Remarks.—This was an extreme case of chlorosis, with great diminution of the quantity of globules, and increase of the watery part of the blood. The dropsy seemed to be caused simply by the condition of the blood and the debility, for there was no albumen in the urine; and though she had been told by a medical man, before being readmitted, that she had enlargement of the heart, the physical signs did not give any indications beyond what are usual in cases of anæmia. The disease was rapidly benefited by the preparations of iron on both occasions, but she could not be persuaded to continue the treatment a sufficient length of time; and a relapse, which is not an unfrequent occurrence in such circumstances, took place after leaving the hospital the first time.

The following case was twice under my care; and from the long continuance and severity of the pain at the stomach, and from the fact of the patient having vomited blood before the first admission, it was thought that ulceration of the stomach might have existed.

2. *Chlorosis, with severe pain at the stomach, treated with syrup of iodide of iron, &c.*—Mary Dutton, aged 22, was admitted on the 9th of December 1846, with severe pain at the stomach, and sickness, and frequent vomiting of her food. She had been in the hospital about a year and a half before with the same symptoms in a very severe form, and after having been treated with the citrate of iron, the syrup of the iodide, and other medicines, she had been completely cured, and remained well, except that she occasionally suffered attacks of sickness and vomiting, till three months before she was readmitted. She was stout-looking, though the complexion was pale and chlorotic.

The catamenia, which had formerly appeared every fortnight, were now present at intervals of six weeks. The tongue was red and furrowed. There was tenderness on pressure towards the cardial orifice, in the same part of the epigastrium where she had formerly felt pain. She was frequently sick after food, and vomited it. The bowels were costive. She had some giddiness, but none of the pain in the head or palpitation of the heart from which she had formerly suffered much. On placing the stethoscope on the veins of the neck, a loud venous murmur was heard, and over the aortic valves an unusually harsh bellows murmur was audible. Three grains of blue pill with two of compound extract of colocynth were given at night; and next morning a draught with two ounces of infusion of senna, one scruple of calcined magnesia, and half a drachm of tincture of henbane, in one ounce of peppermint water. The bowels being opened by these medicines, hydrocyanic acid with soda and peppermint water was given to remove the pain and irritability of the stomach; and on the 14th five grains of citrate of iron were ordered thrice a day in infusion of calumba. She continued this with benefit till the 27th, when half a drachm of syrup of iodide of iron was given three times a day in water. This medicine caused at first some sickness, but she steadily improved in appearance, and the pain at the stomach and vomiting entirely left her. The catamenia were present once while in the hospital. On the 4th January she was dismissed cured, and there was then no bellows murmur at the heart, and the venous murmur was very indistinct.

The following case was admitted under the care of my colleague, Dr Scott, and came under my observation from being committed to my charge in his absence.

3. *Abscess of the right ovary opening into the rectum.*—A girl, aged 17, a servant, was admitted on the 2d of June with tenderness and swelling of the abdomen. It had come on ten days before, from getting wet when menstruating; but before this the catamenia had been irregular. She was pale, with the cheek slightly flushed. In the right iliac region there was a tumour, which was so tender that it could not be carefully examined. There was thirst; the tongue was slightly furred, and the bowels were costive. The skin was rather hot, and the pulse 102, small. Twelve leeches were applied, and two grains of calomel with a quarter of a grain of opium were given every fourth hour. The next day there was much less tenderness, and the tumour was found to be situated almost in the median line, but more to the right, and extending from the pubis nearly to the umbilicus. It felt solid, and yielded a dull sound on percussion. No areola was found on examining the breasts.

The pills were stopped, and a dose of castor oil given. On the 6th the tenderness had increased, and a blister was applied. This relieved her, and she afterwards took iodide of potassium. On the 17th the swelling had diminished, and she had scarcely any pain; but she suffered from sickness, for which hydrocyanic acid was prescribed. The patient after this passed under the care of Dr Scott. The tumour continued with little change until fluctuation became distinct. On the 2d of July she passed a large quantity of purulent matter from the rectum. This was followed by great relief, and the tumour immediately subsided. The improvement was, however, of but short duration; for hectic fever came on, and she became more and more emaciated, till the 11th August, when she died.

On making a post-mortem examination, it was found that an abscess of the right ovary had opened into the rectum.

Remarks.—Inflammation of the uterine appendages, terminating in the formation of pelvic abscess, is not an uncommon disease in the puerperal state, and the subject has been ably treated of by Dr Churchill, in a paper in the 24th vol. of the Dublin Journal of Medical Science; and by Dr Lever, in a paper in Guy's Hospital Reports, 1844. Inflammation and abscess of the ovary is, however, a much less common disease in the non-puerperal state, though it would appear from a discussion on a paper upon this subject, at a meeting of the Royal Medical and Chirurgical Society, January 1848,* that the disease is sometimes overlooked when the abscess opens into the vagina. Dr Churchill has detailed two cases of ovarian abscess in the non-puerperal state, in both of which it made its way into the rectum. Dr Copland has stated that he had notes of four cases of acute ovarian inflammation, in one of which it was caused, as in this case, by sudden suppression of the catamenia. The inflammation will frequently terminate in resolution, when treated at an early period with active antiphlogistic measures—leeches, purgatives, &c.; and when suppuration takes place, the abscess generally opens into the vagina or rectum, but sometimes externally, or into the bladder or peritoneum.

ART. III.—*Remarks on the Sickness and Mortality among the Emigrants to Canada in 1847; with Suggestions for an Improved Method of Regulating Future Emigration.* By THOMAS STRATTON, M.D., Edinburgh, Surgeon Royal Navy,

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* Medical Gazette, February 11, 1848.

Particular Service. (In a Letter to Sir William Burnett, M. D., K. C. H., Director-General of the Medical Department of the Navy.)

The number of emigrants that left the British Isles for Canada in 1847 was three times greater than that in the season of 1846. The sickness and mortality among them has been very great; and the distress and destitution thereby resulting to the surviving relatives, has been such as to claim from the humane all their sympathy, and from those in authority all their ability to remedy such evils and to prevent their recurrence.

The following is a copy of a report by Mr Buchanan emigrant-agent at Quebec, of the number of emigrants that arrived at Quebec and Montreal during the season of 1847 up to the 10th of November, and compared with the total number that arrived in 1846: there is also stated the mortality in 1847.

Embarked from.	Steerage.	Infants.	Cabin.	1846. Total.	Steerage.	Infants.	Cabin.	1847. Total.
Scotland,	1494	31	120	1645	3462	174	116	3752
England,	8435	455	273	9163	29,833	2305	190	32,338
Ireland,	20,169	673	207	21,049	51,129	2835	365	54,329
Germany,	875	21	0	896	7458	226	13	7697
Total,	30,973	1180	600	32,753	91,882	5540	684	98,106
Deduct last year's emigrants, .					30,973	1180	600	32,753
Additional number in 1847, . .					60,909	4360	84	65,353

Number that died on the passage across the Atlantic, . .	5293
Admitted into Grosse Isle Quarantine Hospital, 8563, of whom there died	3452
Died in the Quebec Marine and Emigrant Hospital, and in the city of Quebec, up to 9th October, ...	1041
Died in the Montreal Emigrant Hospital, and in the city of Montreal, up to 1st November, ...	3579
Total deaths,	13,365

(Signed) A. C. Buchanan, Chief Agent.

Up to the 1st of November, and as far inland as Montreal, one emigrant in every seven had died. Many of those who passed on from Montreal sickened and died at one or other of the various places on their route,—Prescott, Brockville, Kingston, Toronto, St Catherine's, Brantford, New London or Amherstburg;—and during November and December, there have been many deaths in the different emigrant hospitals; so that it is understating the mortality to say that one person in every five was dead by the end of the year. The number that died on the passage is 5293. I believe I am correct in stating that only three or four ships carried surgeons;—so that almost the whole of this large number died in a situation where there was no medical aid. The proportion of passage-deaths to passengers is about one in eighteen, which is in sad contrast to what it was some years ago, when it was one in two hundred.*

In the Kingston (Canada) Emigrant Hospital, from the beginning of the season up to the 18th of October, there were 1959 admissions and 707 deaths; the mortality being 35 per cent.; and 431 patients remained in hospital.

In the Toronto Emigrant Hospital, from the beginning of the season up to the 22d of October, there were 3300 admissions, and 757 deaths; being about 22 per cent.; and 739 patients remained in hospital.

Sickness.—In the ships where there was so much mortality (and in some vessels one-third, and in others three-fifths of the passengers died), there was, of course, among the other passengers, a great amount of sickness, weakening them for one, two, or three months, and incapacitating them for labour on their arrival in America.

Causes of the Sickness and Mortality.—The sickness and mortality were almost entirely from fever (typhus and that variety of it called ship-fever) and dysentery; and in some of the ships sailing from ports in Ireland, or from Liverpool with Irish emigrants, we may reasonably suppose that some of the passengers might embark infected with typhus, and this would, in a week or so, develop itself, and afterwards spread among the passengers. Dysentery sometimes arises from improper and imperfectly-cooked food, and in certain circumstances it also is (occasionally) infectious,† so that it would, perhaps, spread in the same way as the fever.

The spreading of these diseases would have been much less, if it had not been aided by want of medical advice, by an over-crowded state of the ship, an absence of due cleanliness, want of exercise on deck, and want of proper means and accommodation for cooking the food.

But, on the other hand, in many of the ships there is no reason to suppose that typhus or its infection, or dysentery, was embarked; and the fever which appeared after leaving port, is sufficiently accounted for by the over-crowding and the deficient ventilation, aided by the predisposing cause of low diet. Typhus, arising in this way,‡ afterwards spreads by infection; and thus the remaining passengers ran two risks of being attacked, that is, from the original cause, and from infection.

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* As stated by Mr Hawes, quoted in Dr Combe's excellent letter on Emigration in the *Times* of 17th September 1847.

† Some physicians consider that dysentery is at times infectious; others that it is not so; and others again that it is infectious only when it is complicated with infectious fever. In the emigrant-ships, there was much dysentery of this last kind. See Dr Craigie's Practice of Physic, i. 920, and Sir George Ballingall's Military Surgery, page 490.

‡ See Dr Craigie's Practice of Physic, i. 335.

Nearly the same remarks may be made regarding the dysentery. It would, in the first instance, arise from the uncooked food and improper diet; and would both continue to be produced by the original cause, and perhaps also be communicated by infection. The sickness from embarked typhus, or its infection, and dysentery, might have been much checked, and that from typhus and dysentery springing up on board might have been prevented by proper regulations. In some ships, from obstacles thrown in their way with regard to cooking, and in others, from carelessness, recklessness, or whatever it may be called, the passengers often did not cook their provisions at all. In others, in obeying the calls of nature, they would not move from their berths; sometimes they would not allow the captain or crew to come down among them, afraid of being forced to wash, or to go on deck; in others, again, they were smoked out, and so compelled to go on deck; and, however well-intended on the part of the master this may have been, it cannot be forgotten, that some, and perhaps many, may have been too weak either to move or even to be moved. Considering all these things, instead of wondering that the mortality on board was so great, we may rather feel surprise that it was not greater.

The Passengers' Act.—The acts of the Imperial Parliament, by which emigration to North America is regulated, are the Passengers' Act, which was passed on the 12th of August 1842, and the Amended Passengers' Act, passed on the 22d of July 1847.

Of the former Act, section 2d exempts passenger ships to North America from having to carry a surgeon.

It prohibits a ship from carrying more than one person to every five register tons; and it enacts that, on the lower deck, each passenger is to have ten superficial feet of "space unoccupied by stores, not being the personal luggage of passengers."

[*Note.*—Ships ought to be obliged to carry surgeons in cases to be afterwards mentioned. The Act ought to specify so many cubic feet of space for each passenger, *exclusive* of the space occupied by his personal luggage; for most emigrants have large chests and boxes taking up the room intended for their owners. These boxes are often nearly empty, or at best, contain apparel of little value even to those to whom they belong. This defect in the Act is a most important one, and ought to be immediately rectified.]

Sections 4th and 5th omit to regulate the height of the berths, and also the distance between any two rows of berths.

[*Note.*—The height of the lower deck is said to be six feet, and the floor of the lower berth six inches above the deck, so that each berth ought to be at least two feet eight inches high. The space between any two rows of berths might be five, six, or more feet.]

Section 6th, Provides that provisions be issued not less frequently than twice a-week, and the following is the scale to be issued by the ship, to those passengers who do not provide their own provisions:—One pound a day of the following articles, bread, oatmeal, biscuit, flour, and rice; half of this diet may be of potatoes, and five pounds of potatoes are reckoned equivalent to a pound of one of the others.

[*Note.*—Considering the improvidence of most of the emigrants, only one day's provisions ought to be issued at a time, as, when issued only twice a week, many of the passengers consume on that day the three or four days' rations, and starve on the other days, and so injure themselves in three ways; firstly, in having nothing to eat in five days in the week; secondly, eating too much on the other two days; thirdly, when the intestinal canal is not distended by food to the usual extent, and on one day a quantity of it, and perhaps of a hard nature (as ship-biscuit), is eaten, painful distension of the canal, or griping, or inflammation, is apt to be induced. This irregularity of diet is also favourable to the production of diarrhœa and dysentery.

With regard to the quality of the diet,—bread may be left out of the question, as for any great number of persons on shipboard, there is no convenience for baking it,—oatmeal is much preferable to wheaten-flour, and care ought to be taken, and very often is not taken, that it be cooked properly, and not taken with cold water only; and also, that it be eaten with salt. Taking the diet as above, a good arrangement of it might be;—on three days a week, half-diet of oatmeal, and the other half potatoes; biscuit on two days, flour on one day, and rice on another; and any deviation from this to be towards oatmeal. But with respect to the quantity of provisions, the above scale may do on an emergency, or for about one week; for a fortnight, double the quantity might be issued, and for any longer period, three times the allowance would not be too much, for the purpose of landing the emigrants in the state of health and strength necessary for their labour. Tea and sugar ought to be issued daily, and beef or pork, if not daily, ought to be granted twice or thrice a week. A sufficiently-full and varied diet will keep the emigrant in good health, and enable him to provide for himself and his family on his arrival, while an insufficient and unvaried diet predisposes him to disease, or actually induces it. By a moderately liberal scale of victualling, the interests of both economy and humanity are at the same time served.]

Section 10th, Speaks of "the victualling of the crew and other persons (if any) on board."

[*Note.*—The master, crew, cabin and steerage passengers, ought to be all numbered together; referring to "other persons" is giving an opportunity for the vessel to have more passengers on board than the Act is *intended* to allow.]

Section 13th. In prescribing the number of boats to be carried by ships of a certain size, it might be specified that the boats are to be able to carry about so many persons; because a vessel may observe the *wording* of the Act, and still have boats unusually small, and insufficiently large for the object in view.

Section 18th, Allows a ship that has cleared with an insufficient number of passengers to embark others, at other places, where there may be no customhouse officer or emigrant agent, and consequently no check on the vessel's carrying more than the allowed number.

[*Note.*—I heard of a ship that cleared with the full number of passengers, and then dropped a few miles down the river; and in the dusk a number of carpenters came on board with wood, and in an hour or two put up rows of berths in places where there was properly no room for them; then about a hundred or more emigrants came on board, and the ship sailed.]

Section 51st, States that "cabin passengers" are not included among "the passengers."

[*Note.*—However the second section numbers the master and crew along with the passengers, they ought to be all numbered together, otherwise it leaves an opening for "evading the Act;" as, if a ship has more than the allowed number of steerage passengers, some of them, during the time of inspection, may be passed off as cabin passengers, and others as belonging to the crew.]

Having thus made a few remarks on what is contained in the Act, I now beg to offer some observations on what is omitted in it.

The Act ought to mention that every child is to be allowed the same amount of provisions as an adult. It ought to prohibit the washing of the lower deck oftener than once a week, and not even then without having previously obtained permission from the surgeon; the deck to be washed *after* the passengers have breakfasted, and before noon, and with no more water than is absolutely necessary. Much disease is produced on board ship by too frequent washing of the lower deck; too much water also is invariably used, and the consequence is, that a deck has hardly time to dry till it is washed again. The bad consequences* of this practice are well known; catarrh, rheumatism, and other complaints are induced in the case of robust seamen, and still more readily in the instance of women and children, and this for two reasons, both on account of their weakness, and because they are more in the damp atmosphere. In some emigrant ships the washing of the lower deck interfered with the cooking of breakfast, and when delayed till the afternoon the deck is not dry by the usual time of retiring to rest.

The Act ought to prohibit any sailing vessel that carries more than forty or fifty steerage passengers from leaving Britain for British North America, at a date in the season later than the 1st of August (although perhaps the 1st or the 15th of July would be a better date); as, when emigrants arrive in the St Lawrence in October or November, they have no time before winter to settle on land, or easily to obtain employment. The ship *Lord Ashburton*, with 470 passengers (of whom 64 died on the passage, and 56 others before they reached Montreal, where three-fourths of the remainder went into hospital; most of the cases were dysentery; in the ship the passengers usually consumed their provisions without cooking them) from Liverpool, arrived at Quebec on the 1st of November; and the *Richard Watson*, with 170 passengers from Sligo, arrived at Quebec on the 7th of November, a date much too late. In the latter vessel there were several deaths from cold, some of the children having no clothing whatever, and their relatives not being able to spare them any of their own.

The Amended Passengers' Act.—This Act makes the Passengers' Act apply to vessels carrying more than one person to every twenty-five register tons; the former Act referring to thirty tons.

Of the Expense of the Emigrant Hospitals in Canada in 1847.—I am informed, from an official source, that up to the end of December, the expense of the Grosse Isle Quarantine establishment, and of the emigrant hospitals in various parts of the province, would amount to about L.100,000 sterling, which is about one pound for every emigrant that left Britain for Canada. Besides the above outlay by government, there are the expenses of private subscriptions for maintaining orphans. I am inclined to think, that by every ship carrying a government surgeon, and by an improved scale of diet, nearly all of the above sickness, mortality, and expense might be avoided, and this at a cost which would be perhaps a tenth or at most a fifth of the expenditure caused by the emigrant sickness in 1847.

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* See on this subject, An Essay on the Baneful Influence of so Frequently Washing Decks, in His Majesty's Ships, on the Health of British Seamen. By Dr R. Finlayson, Surgeon, R. N. London, 1823.

Of appointing Surgeons to Emigrant Ships to North America.—Two things are at present wanted in emigrant ships to North America. One is, to have a government agent on board to prevent too many persons from being embarked, and to see that the passengers have justice done them, with respect to their provisions, water, accommodations, convenience for cooking, ventilation, &c. The other desideratum is to have a surgeon, and some consider that it would be difficult or impossible to procure as many medical men as would be required for the purpose. To this objection I reply, that there certainly will, and ought to be, great difficulty in doing so, if the remunerating of them be left in the hands of the ship-owners, who have not the inclination to pay them according to the value of the services rendered. The advantages of having a government agent, and also a surgeon, may be conveniently combined by the Act requiring, that every sailing-vessel to North America which carries more than sixty persons (master, crew, cabin and steerage passengers included), shall have on board a naval medical officer, who shall be in the same position as the surgeon-superintendent of a convict ship. A sum equal to his pay and expenses might be charged by government to the ship, and he, appointed and paid by the admiralty, would be independent of the owners, and would see that the passengers were fairly treated in all respects, and that no more than the allowed number was embarked.

To ships carrying under 150 persons (crew, cabin and steerage passengers included), there might be appointed an assistant-surgeon of the royal navy of at least four years' standing; he to have full pay from the date of appointment, and for five weeks after the ship's arrival in the destined American port; to have travelling expenses from London or elsewhere to the British or Irish port of departure; to mess in the cabin with the master, and at the ship's expense; his connection with the ship to cease on the emigrants leaving it; to have certain travelling expenses from Quebec, &c. to New York, Boston, or Halifax, for the purpose of proceeding home by the first Halifax mail steamer, in which his passage would be paid; also, that his remuneration might bear some proportion to his trouble, he might have allowed him some sum, say five shillings for every passenger *landed in America.*

To ships carrying more than 150 persons, a surgeon of the royal navy to be appointed as above.

It has been said that it would be impossible to obtain a sufficient number of surgeons for emigrant ships; and certainly, even if sufficiently well paid, it would not be an easy matter to procure from among civil surgeons a sufficient number, as it would never answer for a private practitioner to leave his practice for a few months to embark on this service. But, by having recourse to the navy medical department, there would be no difficulty; as, on their return to Britain, if they did not make a second American voyage that season, some naval appointment would perhaps be falling vacant; or, in any case, they might in the usual way go on half-pay for a short season. The period of service in emigrant ships ought, of course, to count the same as service in one of Her Majesty's ships.

Suggestions for an Improved Emigration System.—I may now recapitulate some of the amendments which I beg to propose, on the present mode of conducting emigration to North America, —and the adoption of which aboard emigrant vessels would tend either to prevent the formation of fever among the passengers, or render it more manageable and less fatal.

1. Every sailing vessel carrying more than sixty persons to have on board a naval medical officer.

2. No sailing vessel having on board more than forty (or fifty) steerage passengers to leave the British Isles for British North America, at a date in the season later than the 1st of August. Perhaps the 1st or the 15th of July would be a better date for the latest period of quitting Britain.

3. The present scale of provisions to be re-considered, and the question entertained whether it might not be made greater in quantity, and more varied in kind, with advantage not only to the emigrants, but also to government.

4. Each passenger to have so many cubic feet of space, *exclusive of the room occupied by his personal baggage.*

5. Several other corrections of, and additions to the Passengers' Act are given above; and I may now conclude these brief remarks with observing that, although this letter be addressed to Sir William Burnett, M. D., I have introduced some medical details and explanations, from considering that it may come under the notice of non-professional readers. For the last four months, since August 1847, I have been constantly engaged professionally in the emigrant hospitals of Grosse Isle (an island thirty-two miles below Quebec), Quebec, or Montreal, and have had ample and varied opportunities of witnessing the condition of the emigrants both healthy and sick.

On the lower decks of emigrant ships ventilation ought to be as much attended to as the weather will permit, and it will be highly conducive to comfort and health to use Sir William Burnett's Disinfecting Fluid (the solution of the chloride of zinc) daily. The proportion of one ounce of the strong fluid to every ten persons is sufficient in ordinary cases; where there is much dysentery, twice or thrice this quantity may be used.

During the past season in Canada a great many medical men, clergymen, magistrates, and others have died of emigrant fever; and emigrants going out as servants to places in the country have soon after taken fever and died, and the disease has extended itself fatally to several others in the house.

I have written these few notes in the midst of more pressing engagements, and have not done the subject the justice that its importance deserves. But I hope I have said enough to show that there are two ways of managing British emigration to North America. One is that of imperfect regulations, causing great sickness and mortality among the emigrants; distress and destitution among the surviving widows and orphans; the loss of many valuable lives in Canada from the spread of emigrant fever throughout the colony; expense to private individuals in providing for orphans, and the outlay by government of about L.100,000 in supporting emigrant hospitals.

And, on the other hand, I have endeavoured to show, that by amending the Passengers' Act, as is herein proposed, all the above evils may be entirely, or almost entirely, prevented; added to which, the expense of the plan would probably be about one-tenth or one-fifth of the sum that the emigrant sickness of 1847 has cost, and a successful attention would thereby be given to the interests both of economy and of humanity.

T. STRATTON, M. D., Surgeon, R. N.

MONTREAL, CANADA,
1*st January* 1848.

Dr Stratton is entitled to much praise for directing public attention to the enormous sickness and mortality taking place in emigrant ships, and to the circumstances under which that sickness and mortality are caused. It may be said without exaggeration, that the whole system on which emigration is at present, and has been hitherto conducted, is one of wholesale homicide; and that nothing so disgraceful to the character of the country and the government has for a long time taken place, as that of the mode in which ships are chartered and authorized to carry away large bodies of human beings to almost certain death. The system is one of emigration indeed, but not to the continent of America, as it is pretended to be. It is emigration from life to death—from the present state of existence to the future.

Of the 98,106 men, women, and children, who emigrated during 1847, it appears that 13,365 died either in crossing the Atlantic, or soon after arrival in America. This, however, is manifestly not the total amount of deaths; for many must have shown symptoms of fever and dysentery subsequent to arrival, and in the progress to the interior; and of them no account is taken in the official estimate. If the deaths from this source be rated at 3000 or 4000, it is certainly not too much; and it may thus be justly said, that in this great experiment of emigration, not fewer than 16,000 or 17,000 persons died among 98,000. That gives a mortality of 1 in 6 at least, probably higher, or 16 per cent. of the whole. It may be safely asserted, that not more than one and a half or two per cent., or not so many, ought to have died during the short time that it takes a good sailing vessel to navigate the breadth of the Atlantic. All these emigrants are persons in average health; some of them vigorous and robust, and in that state in which, excluding the pernicious system under which they were conveyed from Britain to America, they ought rather to have improved in health than to have deteriorated. Such, however, are the arrangements on board emigrant vessels, and such the accomodations, that they are doomed to certain sickness, and a considerable proportion to certain death, before reaching the end of the voyage; while of those who survive, many must be cut off soon after landing.

Even the convicts are greatly better off than these unfortunate emigrants; and never did so great mortality take place in any convict ship, though the voyage occupies a greater number of months than the emigrant voyage occupies weeks. Had any convict ship containing 200 persons, condemned to visit the long isles of Sidney Cove or Norfolk Island, lost in the outward voyage 16 or 20 of their number, such a storm of obloquy would have been raised about the heads of ministers in Parliament, that for seven or eight months nothing else would have been heard of but the cruelty and the incompetence of the authorities in allowing such a calamity to happen. In the case of the emigrants, 98,000 hard-working people, accused of no crime but that of poverty, sober, decent, and respectable in their rank, endeavouring to flee from the wretchedness of an over-crowded country at home, in order to try what chances of improvement, in their several conditions, another country affords, are more than decimated in the attempt; and not one word of disapproval, censure, indignation, or horror is uttered. It can no longer be matter of doubt, that felons and delinquents are much better cared for in Great Britain, than the hard-working labourer and the steady but impoverished artisan.

The statements made by Dr Stratton, as to the true cause of all this mortality, deserve most serious attention, and this we trust they shall obtain. He is quite right in suggesting that the whole system should be placed under the strictest inspection; that a surgeon should be appointed to each vessel, at whatever cost; that no vessel should be allowed to leave an English port so late in the season as to meet with long nights and bad weather; and that, above all, sufficient space should be provided for each emigrant.

The last condition is in truth the great one necessary for preventing the recurrence of the evils, with which the emigrations of 1847 have been attended. It may be justly said that the crowding so many persons within ships so small was the main cause of the sickness and mortality; and that not even a medical officer to each ship could have been of much avail, unless the emigrants had been provided with sufficient space for breathing, and unless they shall be so much less numerous than they were in those vessels, that they might have opportunities of attending to personal cleanliness and other duties necessary to the preservation of health. When on board a vessel like the Lord Ashburton, not exceeding 500 or 560 tons, 470 persons were crowded, it is not difficult to account for the origin and severity of disease. Had such a vessel taken 200 passengers, or even 150, it was a greater number than she ought to have received; and the more beneath these numbers, the better chance would the rest have of preserving their health.

The whole business shows the selfishness and rapacity of ship-owners and ship-agents, and the shorted-sighted policy of the government authorities; as it may be proved most clearly, that the conveyance of these people to the shores of America in a state of health is, in the long run, the least expensive.

It may be safely laid down as a principle, that in order to convey across the Atlantic 100 persons without injury to their health, supposing the voyage to occupy at an average six weeks between port and port, a vessel of at least 600 tons is requisite; and for the conveyance of 150 persons, tonnage to the extent of 150 tons additional, or a vessel of 750 tons, is necessary. In all cases in which the vessels are under 600 tons, a proportional diminution in the number of passengers ought to take place. Thus, a vessel of 500 tons cannot convey more than 80 passengers with any attention to cleanliness, comfort, and health, during a voyage occupying the space of six weeks.

These small numbers of passengers, compared to the tonnage and accommodation afforded by the vessels, will, no doubt, excite the astonishment, and probably raise the opposition, of all ship-owners, emigration agents, and similar persons who have been for years making money on the public and the sufferings of the emigrants. This is nothing to the purpose.

We know that it is right, and that is sufficient. Any attempt to depart from the principle now enunciated will continue all the evils and calamities hitherto attendant on emigration; and it will be quite as humane, and not less consistent, to allow the emigrants to starve at home, as to carry them on a voyage so certainly fraught with destruction.

ART. IV.—*Physiologico-Pathological Researches on Tuberculosis.* By Dr H. LEBERT, Practical Physician in Bex, Switzerland. (Müller's Archiv. fur Anatomie, Physiologie und Wissenschaftliche Medicin. Jahrgang, 1844. Berlin, Seite 190.) From the German.

PART II.—ON TUBERCLES IN OTHER ORGANS AND TEXTURES BESIDES THE LUNGS.

II.—ON TUBERCULOSIS IN THE LYMPHATIC GLANDS.

I COME now to a part of pathology which furnishes the greatest number of problems, and especially contains that undetermined question,—how far scrofula and TUBERCULOSIS are identical, or differ from each other, and whether there be a peculiar scrofulous matter accurately demonstrable by pathological anatomy, which forms the swellings denominated scrofulous, and which is different from tubercular matter? I confess that, however important this question may be, we are not yet in a condition to answer it in a satisfactory manner.

TUBERCULOSIS of the lymphatic glands may be pathologically distinguished into three principal categories; that of the bronchial glands, that of the mesenteric glands, and that of the external superficial glands, namely, the cervical, axillary, and inguinal glands.

Though these different categories often appear simultaneously in the same subject, yet this is by no means always the case. They present in their course considerable differences. The mesenteric glands we find much seldomer softened and surrounded with purulent matter than the other glands. Of softening, we find in the observations of Papavoine two interesting examples.* But in general these glands attain a large size without undergoing any change, and without exerting any compression on the surrounding vessels. The latter is frequently the case in tubercles of the bronchial glands, and it induces in consequence periodical œdema. These glands are also more disposed to suppuration and effusion in the surrounding textures. The external glands, when tuberculated, have in like manner a decidedly expressed tendency to suppuration; and, as their opening externally is easily accomplished by means of the suppuration around the tubercles, almost may entirely expel the latter, and afterwards be healed with marks of loss of substance and the well-known scrofulous scars.

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* Papavoine Memoires sur les Tubercules. Journal de Progres, T. ii. Journal Hebdomadaire, T. viii.

The frequency of tuberculosis in the bronchial glands, many recent observers have established; and though Rilliet and Barthez, among 291 cases, found these glands thirty-six times in a tuberculated condition, without the lungs being tuberculated, yet these distinguished observers also decidedly prove that the bronchial glands by no means constantly contain tubercles in childhood, when they are found in other organs, as in the law enunciated as to adults by Louis.[*]

Tubercular matter is in other respects the same in the lymphatic glands as in other organs. We recognize distinctly tubercular *corpuscula*, oftimes a considerable development of black colouring matter, frequently the elements of calcareous transformations, often around them strong development of vessels, occasionally mixed with them, small elementary cells of glands, and around these a fibrous *stroma*. Tubercles are found sometimes in small circumscribed yellow-gray masses, sometimes in the form of an extended infiltration. In softening and suppuration, the disintegrated mass is effused generally in the neighbourhood, especially in the *bronchi*, as has been already mentioned. The tubercular mass may, nevertheless, in rare cases, be absorbed, and then it leaves behind empty cavities, of which Rilliet and Barthez give a remarkable example.[†]

Adhering to the principle, not to detail here what is already well given in elementary works, I am content to adduce some of my own observations on the different peculiarities of the glandular tubercles, and to refer, especially as regards tuberculosis of the bronchial glands and the mesenteric glands, to the excellent work of Rilliet and Barthez.

From my own observations I adduce particularly the following facts:—

1. In a child of two years and a-half old, who died with all the symptoms of marasmus, I found in the cervical, bronchial, and inguinal glands, extensive tubercular deposits. The lungs, examined with the greatest care, presented no tubercles, and were the seat only of interlobular emphysema. In the bronchial glands, the tubercles were partly converted into calca-

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[*] Rilliet et Barthez Traité Clinique et Pratique sur les Maladies des Enfans, Paris, 1843. Tome iii. p. 166.

[†] Ibid., Tome iii. page 164–219, and p. 406–435.

reous masses, in which were found, with amorphous mineral granules, tubercular *corpuscula.* The tuberculated cervical glands were considerably enlarged; several were in the process of softening; others were softened and suppurating; others again presented in their interior deposits of crude tubercles, in yellow cheese-like masses, which in some lay together, in others separated small cavities filled with glandular substance. Beneath the microscope there were seen in the latter glands the following objects:—

1. Very pale *corpuscula,* from 0.0084 to 0.0108 parts of a millimetre in diameter, smooth, round or oval, moderately flat, without nucleus or granules; these were most probably the normal glandular elements. 2. Something smaller *corpuscula,* 0.005 of a millimetre in diameter, of irregular angular outline, containing granules but no *nuclei,* consequently true tubercular cells. 3. Granular globules and true pus globules in the suppurating glands. The mineral constituents were soluble in hydrochloric acid. The *corpuscula* described under the first head were also found in sound lymphatic glands of the neck. The small circumscribed tubercles in the destroyed glands were in part still semitransparent.

2. Mademoiselle T., aged 13 years, of a healthy family, in which no trace of scrofula had appeared, continued in perfect health to her ninth year (1836). A very extensive burn of the skin of the chest was followed by a protracted suppuration, and exerted on the whole constitution a pernicious influence. In the winter of 1837–1838, I treated the patient for an obstinate attack of *bronchitis,* which only got well in the spring. At this time the glands in the neck had already become affected with swelling. The health of the patient was tolerable to harvest of 1839. From this time she began to suffer from ophthalmia, which affected both eyes, but had its particular seat in the right eye, and affected the conjunctiva of the eyeball and the eyelids to such a degree as to produce in various points *phlyctænæ* and superficial ulceration at the edges of the cornea. The intolerance of light was considerable. Under the employment of moderate local antiphlogistic measures, gentle laxatives, derivatives, frictions with ointment of tartarized antimony, the local application of narcotic infusions with borax, afterwards slight astringents, solutions of sulphate of zinc, nitrate of silver, and similar agents, considerable amelioration was at first effected. After some months, however, the disorder in the eyes became much worse and constant, all the remedies employed availing nothing; the glands of the neck enlarged more and more in size; on the face and over the neck appeared

an impetiginous eruption; while dry cough with difficulty in breathing, a dull sound from percussion on the space below the collar-bones, and *rhonchus* in breathing difficult to be observed in various spots, led me to infer the existence of *tuberculosis* of the bronchial glands. A seton in the neck, the decoction of Zittmann, afterwards hydriodate of potass, acorn coffee baths impregnated with salt and iodine, and the whole series of collyria employed in such cases, produced no improvement. The patient became daily feebler, pined visibly; the eye disorder had in a slight degree improved, but the affection of the external and the internal glands had made greater progress; externally, swelled glands were found in large quantity in the armpit, in the neck, and especially under the collar-bone. During the last days of life, the breathing became very confined; a dull sound on percussion was emitted in the region of the heart; the beats of the heart and arteries were so frequent that they could scarcely be numbered; the pulse was very small and irregular; the cough continued dry, attended with sibilant rhonchus; symptoms of suffocation from time to time ensued, and, after a lengthened agony, the patient expired on the 26th of March 1844.

Inspection of the chest and throat thirty-two hours after death disclosed the following state of the parts. As the case occurred in private practice, I had not permission to examine other cavities. The lungs were united to the costal pleura in part by false membrane of long duration. Within the cavity of the *pleura* and also that of the *pericardium* was found a considerable quantity of serous fluid. The lungs contained in their upper lobes small crude tubercles; some lobules were in a state of hepatization; and in several places the lungs were œdematous with infiltrated fluid. The bronchial glands were generally affected with tubercular deposition, and formed considerable masses round the windpipe, the upper lobes of the lungs, and in the anterior mediastinum. Some of these showed at the surface an inflammatory redness which in many spots passed into bluish and gray. In the section of one gland I was able to trace several capillaries proceeding from the vessels of the gland itself into the tubercular deposition. The tubercular matter presented all its different elements, and especially much hyaline intermediate ligamentous substance. In the softened gland were found many granules and *pus*-globules.

The cervical glands, when divided, were found to be surrounded by a vascular capsule consisting of cell-fibre *fasciculi*, which at its surface presented an alternating yellow and reddish colouring. When the glands were divided in the middle, we recognised the fibrous glandular structure, which enclosed many small excavations entirely filled with tubercular matter, and which in other glands was deposited in so great amount that they had entirely compressed the glandular tissue, and only the fibro-cellular capsule was left. The tubercular substance had its well-known cheesy-like aspect, and consisted entirely of granules and irregular tubercle-cells rising to about 0.01 parts of a millimetre in diameter. Nowhere among these were fibres observed. At the surface of the glands were found adipose tissue between the fibrous *fasciculi.*

The palpebral *conjunctiva* presented a considerable development of the Meibomian glands. At the margin of the lower left eyelid was found a small gland the size of a vetch, softened internally, in which microscopic examination demonstrated clearly tubercular *corpuscula* in the course of softening.

I found, besides, in this body a remarkable alteration. As was conjectured from the symptoms, the heart was in a state of disease. It was extensively and greatly enlarged, and the seat of evident *endocarditis.* The *endocardium* was injected, softened, and thickened, and covered in spots with false membrane. To these, particularly in the left ventricle, were attached several round cysts of the size of peas, which contained internally a yellow puriform fluid, and in which the microscope demonstrated not distinctly the existence of *pus*-globules and many yellow granules. These cysts were externally red, not from vascularity, but imbibition. Their inner surface was yellowish, gliding in many places into gray. The substance of the capsule consisted of irregular, lamellated, granular, elastic fibrine, not distinctly fibrous. The *endocarditis* was evidently acute, and had no direct connection with the tubercular process.

3. Mademoiselle J. D., aged 16 years, of distinctly-marked scrofulous habit, excepting the ordinary disorders of children, enjoyed good health till her twelfth year. Four years previously she had begun to have swellings and indurations of the glands of the neck and in the parotid region, which partly proceeded to suppuration. She had frequently suffered from pains in the head. The *catamenia* had come on regularly since 1843. For the space of about eighteen months this young lady had suffered several attacks of thoracic catarrh, with expectoration of rather lengthened duration, from which she had however again recovered. Examination of the chest furnished no certain indications of pulmonary tubercles. In the neck, as I had ascertained on the 30th of May 1843, was a mass of swelled glands, especially on the left side, from the ear to the throat, of the size of a hazel-nut to that of a hen's egg. The skin covering the hardest of these glands was not reddened; but in several points it was possible to recognize at some depth softening and

fluctuation. The glandular swellings on the left side were placed in the manner of a necklace or rosary close to each other in the course of the large vessels of the neck, and so impeded the circulation that the face was on this side redder in colour than on the right, and a little swelled. I accordingly resolved to extirpate these glands, which I did on the 13th of June 1843.

The swelling was seven centimetres long, and between three and four centimetres broad. It consisted of three glands placed next to each other in the long axis, the uppermost of which lay behind the angle of the lower jaw, while the other two lay below the inner margin of the sterno-mastoid muscle. In the sections made in different directions, we found almost the whole interior portion of the glands composed of tubercular substance already distinctly perceptible by the naked eye; and by the microscope we distinctly recognised as the predominant element the well-known irregular tubercle-cells, from 0.0062 to 0.0075 parts of a millimetre in size, with thin granules deposited within their substance. These *corpuscula* lay closely pressed to each other, and presented, with a low magnifying power, a fine granular aspect. Among these we saw a quantity of tabular crystals of cholesterine. Acetic acid produced no change on the cells. The uppermost gland contained especially crude tubercular matter. The other two were partly softened and taken in the stage of suppuration; and both by the naked eye and by the microscope it was possible to distinguish a mixture of tubercular *corpuscula* and pus-*corpuscula*. The former were a little enlarged by the process of softening. When acetic acid was allowed to flow by capillarity between the two glass plates beneath the microscope, we saw of the *pus-corpuscula* only the residual small *nuclei*, while the tubercular corpuscula were unchanged. In glandular tissue partly sound, around the softened tubercular masses, were found very minute crude tubercles surrounded by a vascular glandular *stroma*. The glandular parenchyma contained globules from 0.01 to 0.0175 parts of a millimetre in diameter, with one or two *nuclei* of 0.005 parts of a millimetre in size, which were deposited in a fibrous network. In the spots in best preservation, the glandular tissue was scarcely four millimetres thick, and the margin of their tubercular purulent cavities was in like manner infiltrated with crude tubercles.

III.—ON TUBERCLES IN BONES.

The observations of Nichet and Delpech, and other early writers on tubercles in bones, had almost been forgotten, when subsequently Nelaton* directed to them the particular attention of pathologists, and found followers among the first authorities in our days, among whom Rokitansky may particularly be mentioned.* In France observers went so far in this direction, that in many Parisian hospitals we heard every example of caries, particularly *caries vertebralis*, designated as tubercles of bone. At a more recent period, again, pathological observers proceeded too far to the opposite extreme, and were ready to deny the existence of tubercles in bones. Both views are manifestly extreme. That the bones may become the seat of *tuberculosis* it is impossible to doubt. Thus I have once observed tubercular matter in a diseased rib, and several times have seen tubercles perforate the breast-bone, and bring on caries. I have farther described, in the *Annales de Chirurgie Francaise*, a very remarkable case, in which a very deformed portion of callus in a rabbit contained two oblong irregular cavities lined with a fibrous membrane, which were quite filled with tubercles in the process of softening, as was afterwards decidedly proved by microscopical examination.

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* Nelaton Recherches sur l'Affection Tuberculeuse des Os. Paris, 1837.

Moreover, I have examined a number of diseased bones, partly from *caries* and *nekrosis* of the cylindrical bones, partly from these diseases in the *vertebræ*, and I have satisfied myself in the most conclusive manner, that *tuberculosis* in bones is a much rarer affection than is usually admitted. I had also occasion to examine a considerable number of specimens which I had under my care in an hospital at Lavey, in which many diseases of bones are treated. I had further, in the Paris hospitals, abundant opportunities of examining diseased bones. Lastly, since pathologists began to attach importance to microscopical researches, there were often given me for examination at the Anatomical Society, specimens in which doubt was entertained whether tubercles in bone constituted the disease in question. By all these inquiries I have arrived at the decided conviction, that observers had in many cases taken concrete purulent matter for tubercles in bone, and that nothing but the most accurate microscopical observation can in doubtful cases decide this difficult question. I entreat the reader to give particular attention to the following observations in order to establish the diagnosis.

1. When in the spongy osseous tissue the areolar structure is still in good preservation, and individual *areolæ* are filled with coagulated stagnant purulent matter, this the observer readily with the naked eye mistakes for the aspect of the yellow cheesy tubercle. When either medullary membrane in good preservation or marrow is mixed with this coagulated purulent matter, as I have often observed, this may give the concrete purulent matter the appearance of semitransparent tubercle.

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* Rokitansky Handbuch der Pathologischen Anatomie, B. ii., S. 210–211.

2. Small abscesses in bone are often enclosed in a fibrous membrane, which then is very similar to the encysted tubercles described by authors.

3. The cavities named bony, especially in vertebral caries, are generally not larger than a cavity containing a detached sequestrum, which, if small, may be partly absorbed. These cavities have throughout no connection with the tubercular ulcerated cavities.

4. In vertebral caries we often find, before the diseased spots of the vertebrae, cavities which are filled with a thick cheese-like semi-fluid, and from which proceed fistulous passages to the regions of the groin and other places. This matter, though similar to that of softened tubercle, is nothing but concrete purulent matter, as correct examination has satisfied me.

Tuberculosis in bones is therefore a much rarer malady than at present many physicians are inclined to believe.

With these observations, as well as to those made upon glandular tubercles, is naturally connected the question above touched, on the relation between Scrofulosis and Tuberculosis.

This similitude the older German schools had recognised, and they had described, under the head of scrofula as a peculiar form of that distemper, scrofulous consumption, (open tubercles, *phthisis pulmonum scrofulosa.*) That school was nevertheless too deficient in precision to procure for their mode of expression great value in disputed questions of pathological anatomy. On the other hand, some pathologists were desirous to banish the term *scrofulosis* altogether from medicine, and regard all spontaneous actual scrofulous affections as tubercular morbid processes. Among others, I have heard M. Velpeau in his clinical lectures decidedly express this opinion.

My own observations have led me on this subject to the following conclusion :—

It is undeniable, and this I have oftimes observed, that many tumours in the glands of the neck considered as scrofulous are of tubercular character, that consequently certain glandular tubercles constitute a certain number of affections designated as scrofulous. On the other hand, I have convinced myself that a large proportion of the diseases of the joints and bones which are considered as scrofulous, are nothing but chronic inflammations of the soft parts of the joints or of the bony tissue, induced by external accidents. It is consequently requisite to proceed in the diagnosis of a scrofulous disease in a more careful manner and on more restricted principles, than is commonly the case at present among practical physicians. On the other hand, I have certainly observed not a small number of patients, particularly children, who suffered sometimes from ophthalmic disorders, sometimes from cutaneous eruptions, sometimes from glandulous swellings depending on the first two, sometimes from disorders of the joints and bones, in whom, consequently, an internal cause of these several pathological processes must be inferred to prevail. But never have I been able, after the most careful examination, to find a peculiar scrofulous matter which is not yet physically proved in syphilis, gout, and other maladies, notwithstanding the justly-admitted *dyscrasiu* of these disorders. The forms of scrofulous distempers of authors I distinguish into three categories. 1. The tubercular morbid process. 2. Chromic inflammations without *dyscrasia*, capable of decided proof. 3. Proper scrofulous disorders having their final principles in matter not hitherto physically demonstrable, probably in the blood, and showing itself under different forms of elimination; —inflammations and suppuration of the textures of the eyes, of the glands, of the skin, of the joints, of the bones, and other tissues.

These questions involve many unsolved problems, and, in particular, accurate researches would be most desirable, in order to ascertain whether glandular *tuberculosis*, without tubercles in the lungs, may take place in a certain number of cases, and, accordingly, the tubercular matter may be capable of external elimination, and the disease be completely curable. This opinion, if I mistake not, has already been enunciated; but it has by no means hitherto been established by proof.

IV.—ON TUBERCLES OF THE NERVOUS CENTRES AND THEIR MEMBRANES.

That tubercles are formed in the brain, and this process belongs to general *tuberculosis*, not to rarely-occurring phenomena, has been long well known. But it is only during the last twenty years that we have acquired more accurate knowledge of one of the most important forms of cerebral tubercles, namely, *meningitis granulosa.* This disease has, in its symptoms and in its pathological anatomy, been studied fully in recent times. But its peculiar tubercular nature has often been made a subject of dispute; and though the opposite opinion has been affirmed on probable grounds, yet is it still left to our microscopical researches to demonstrate the existence of the peculiar element of tubercles in these granulations of the cerebral membranes, as previously in the gray semitransparent granulations of the lungs.

As to the more accurate description of *meningitis granulosa*, we are in condition to prove, from several able essays which have appeared since 1830, by Papavoine,[*] Gerhard,[†] Ruff,[‡] Piet,[§] and Rilliet and Barthez,[‖] who have particularly described this disease as it appears in childhood, and as almost peculiar to that age; and lastly, Lediberder,[¶] who proves that this disease arises also in adults more frequently than has been hitherto believed.

A fact not unimportant to the history of medicine in relation to this interesting discovery, we take this opportunity to adduce. To the kind communication of our friend Dr Lombard of Geneva, honourably known in medical literature, we are indebted for a delineation which was given to him by Dr Alison of Edinburgh, and in which, under the name of Diseased *Pia Mater*, the tubercles are distinctly represented, and in the figure are marked as Effusions wholly Tubercular. Of this delineation, the date is 8th February 1824. The case is described by Dr Alison in an essay on the subject.[**]

The seat of cerebral tubercles, especially the proper *meningitis granulosa*, is in the cerebral membranes, mostly beneath the *pia mater*. The yellow caseous tubercular infiltration may also be formed beneath the arachnoid membrane. The granulations are found in largest quantity around the greatly injected capillaries, attended by a diffuse red colour, sometimes in the hemispheres, sometimes in the base of the brain, particularly frequent in the fissure of Sylvius. They consist of a fibrous tissue belonging to the serous membrane, and distinct tubercular *corpuscula* lying between the fibres, some hyaline connecting tissue, but little granular matter. Around these tubercular *corpuscula* are seen not unfrequently epithelial cells. Their size varies from one-sixth of a millimetre to one or two millimetres. They are formed only in scrofulous subjects. They are found in the brain frequently along with yellow miliary tubercles and larger tubercles. The tubercles proper to cerebral substance are developed either on the surface of the brain, and sink between the convolutions into the substance of the organ, or are developed primarily in the midst of the cerebral substance, and often attain the volume of a hen's egg and more. In these we see usually the tubercular *corpuscula* very distinctly.

As in general tubercles of the nervous centre is a subject rather new to the microscope, I regard it indispensably necessary to adduce in short compass from my own observations a series of examples of the lesion, which will give the attentive reader more correct views on its nature than can be conveyed by abstract general descriptions.

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[*] Papavoine, Journal Hebdomadaire, T. vi. p. 113. Paris, 1830.

[†] Gerhard, New American Medical Journal. April 1834.

[‡] Ruff, Dissertation Inaugurale. Paris, 1835.

[§] Piet, These. Paris 1836.

[‖] Rilliet et Barthez, Traite Clinique et Pratique.

[¶] Lediberder Dissertation Inaugurale, 1837.

[**] Edinburgh Medico-Chirurgical Transactions, vol. i. 1824, p. 438.

1. A child ten years of age died from tubercles of the lungs, the bronchial glands, and the membranes of the brain. The *pia mater* was red, vascular, around the capillary vessels the seat of diffuse redness, and in many spots opaque, dull, and yellowish. It contained a quantity of granulations, the diameter of which varied from one-sixth of a millimetre to one millimetre. These were situate particularly in the neighbourhood of the vessels, yet presented no capillaries in their interior substance. They were particularly numerous in the hemispheres, and in the left fissure of Sylvius. The cell-fibres of the *pia mater* formed the basis of the tubercular *corpuscula*, which lay imbedded among these fibres with their usual characters, though small, from 0.005 to 0.006 of one millimetre, with minute granules. At the surface of the *pia mater* were seen in several spots distinct epithelial cells, which had no connection with the tubercles. The granulations had in other respects a diffuse, not constantly regular round outline, and the fibres were nowhere thickened, so as to form a bounding capsule.

The surface of the brain was softened and greatly injected, and adhered like a soft pulp in many places to the inner surface of the *pia mater*. The cylinders of the cerebral substance presented in these places indistinct lacerations, were partly dissolved in a granular mass, and showed many fragments of different lengths.

2. In a child of seven years, with tubercular disease, there were found, especially at the base of the brain, marks of *meningitis granulosa*, and, both in this situation and at the upper commencement of the spinal arachnoid membrane, inflammation with exudation. The exudation, however, was not very fluid. The pseudo-membranes were moderately consistent and elastic, and contained many cells with a nucleus, caudate *corpuscula* and fibres, in short, many fibro-plastic and few purulent elements. The granulations extended laterally upon the brain, and were in considerable quantity in the fissure of *Sylvius*. They were from half a millimetre to one millimetre in diameter, were difficult to be isolated, surrounded with diffuse vascular injection, and consisted of much hyaline intermediate connecting matter and tubercular *corpuscula*, containing neither vessels nor fibrous elements except those of the serous membrane.

3. In a child two years old I found in the upper middle part of both hemispheres, beneath the arachnoid membrane,—first, yellow, considerably diffused, cheesy, tubercular infiltration; secondly, disintegrated yellow miliary tubercles; thirdly, beneath the *pia mater* a quantity of gray semitransparent very small granulations. In these three different forms of tubercle

I ascertained decidedly the presence of the common tubercular elements, the irregular tubercular cells.

4. In a child, aged three years, affected with tuberculous disease, I found in the upper parts of the hemispheres yellow tubercular infiltration, and in the *pia mater*, and partly in the bottom of the convolutions, arranged in clusters round the vessels, a quantity of small gray granulations, which were very hard and fibrous, and contained proportionally only a small amount of hyaline and cell-like tubercular matter. From the bottom of one of the convolutions arose a tubercle as large as a pea, which penetrated to the depth of five millimetres, into the substance of the brain, and which made known its origin from the cerebral membrane, by its firmness proceeding to cartilaginous hardness, and its fibrous structure.

5. In a male, aged 35 years, I found an intense inflammatory tubercular *meningitis*. The *pia mater* was very greatly injected, in many spots rendered opaque by more solid effusion, and contained a number of granulations in which tubercular *corpuscula* were easily recognised. The surface of the hemispheres was injected rose-red, much inflamed and softened. In both lungs was found a great quantity of miliary tubercles, with which the individual might have lived yet a long time, had not the tubercular *meningitis* speedily produced death. This is another proof of the different operations of similar diseased formations, according to their different seats, and according to the importance of the organ.

6. In a child of six years, we found in the brain, between the *tentorium cerebelli* and the *cerebellum*, several surrounding tubercles varying from the size of a small hazel-nut to that of a walnut, of irregularly round shape. Some were still hard and yellowish, white in colour; others began to soften in the centre; and in the largest the middle was dissolved in a yellow-red semifluid pulp, in the substance of which vessels were observed.

7. In the left side of the cerebellum of a child of three years, I found a thick yellow tubercle 15 millimetres long, and 9 millimetres broad, in which the granules and cells of tubercle were very distinctly recognized. The surrounding cerebral substance was inflamed, partly softened, and contained many aggregate globules.

8. I had lately occasion to observe a remarkable instance of tubercles in the cerebral substance. A man, aged fifty years, was brought in a state of apparent drunkenness to the Hotel-Dieu in Paris. The patient died at the end of four hours. The lungs were tuberculated, and contained, besides, many miliary tubercles. The brain contained at the posterior portion of the right hemisphere, rather near the surface, a pretty ex-

tensive infiltration of tubercles of yellowish colour, passing in many spots into greenish, of uniform cheesy appearance, indicating itself through cerebral substance a little softened. The mass of brain surrounding the infiltration was similarly softened, in many places white, in others reddish in colour. When a stream of water not very strong was allowed to fall on this softened cerebral substance, there was left only one cavity, while much softened cerebral matter was carried away as detritus. The seat of the tubercles appeared to be the centre of the convolutions, and the deep-red coloration appearing in them depended partly on the accumulation of many capillaries from the compression by the tubercles. These last possessed a pretty firm consistence, but presented no fibrous appearance, and might easily be separated into friable masses.

The tubercular *corpuscula* were very distinctly observed. They presented an irregularly round or oblong figure, which belonged to the granules, and were 0.0075 parts of a millimetre in diameter. The granules were from 0.0012 to 0.0025 parts of a millimetre in diameter. The intercellular substance was found proportionally in smaller quantity, and very little fatty matter was observed. In the softened cerebral substance was found a quantity of partially-destroyed cerebral fibres.

9. In the museum at Zurich I found an interesting example of tubercles in the spinal marrow. In the lumbar portion of the spinal chord was situate a tubercle 18 millimetres long and 13 millimetres broad, in which I found tubercle-cells distinctly among the granules. The spinal marrow appeared in the neighbourhood to preserve its normal condition; nevertheless, on this point I cannot engage to speak decidedly, as the preparation was preserved in spirit of wine.

V.—ON TUBERCLES IN THE LIVER.

The external covering of the liver is, particularly in tubercles of the peritonaeum, not unfrequently the seat of gray semi-transparent or yellow miliary tubercles, or even of larger tubercular masses, which may extend from the surface to a greater or less depth in the proper substance of the liver. These tubercles, however, I do not refer to the proper tubercles of the liver, which are of much less frequent occurrence, and which Louis has only had occasion to observe twice.

In children, who often have tubercles in the peritoneal covering of the liver, I have only once found small tubercular masses deep in the substance of the gland. It was indeed a pure accident that in this case, along with the peculiar cells, fibrous formations and caudate *corpuscula* were found, and it was the case already mentioned of fibre-constituents which were secreted with the tubercular elements.

Twice I found tubercles in large quantity in the bodies of adults; and this suggests a question of the greatest importance in diagnosis. Both cases presented, on examination with the naked eye, everywhere the characters belonging to cancer (*enkephaloma*), and it was only microscopical inspection that rendered their true nature evident; and certainly these tubercular affections have repeatedly been taken for that which is described by Cruveilhier as cancer of the liver in disseminated masses.*

These two cases are sufficiently important to justify a detailed account of them.

1. On the 23d of January 1843, Dr Deville, then resident pupil at the Hospital St Antoine, brought me from that hospital, for examination, a diseased liver, which all the physicians had hitherto pronounced to be an instance of cancer of the liver (*enkephaloma*). Careful investigation presented the following results. The liver was enlarged to more than three times its normal dimensions. On the convex surface were a number of yellowish masses, the smallest of which was two millimetres in diameter. In the right lobe were also a number of these masses, which were from four to twelve millimetres in thickness. Each of these masses consisted of a mixed yellow and reddish coloration, and was composed of a number of smaller masses, the smallest of which were scarcely two-thirds of one millimetre, and were irregularly round or oval. Towards the middle, all these masses coalesced in one single homogeneous body. In many places these masses lay close under the surface of the *peritonaeum*, and formed slightly convex elevations, and others were covered by a slender layer of hepatic tissue, while others sunk deep into the substance of the gland. These tubercular masses were everywhere surrounded by a considerable development of vessels, and in many spots ecchymotic effusions had taken place. In the interior of the hepatic substance, corresponding to the point of the insertion of the suspensory ligament, there was a tubercular mass of eight centimetres in diameter. In many spots these morbid formations presented a yellowish-green coloration proceeding from biliary elements. At the upper part of the left lobe was a mass quite as large, and in several places several considerable but something smaller masses. In all the sections of the liver similar masses were encountered.

The sections showed a yellow cheesy surface, composed of a great number of small masses of the size of half a millimetre to one millimetre, between which were situate partly blood-vessels, partly hepatic substance. All these differently-formed morbid masses, however, presented, besides granules and hyaline fluid, only one individual constant microscopic element, namely, irregular *corpuscula*, from 0.0075 parts of a millimetre to 0.01 part of a millimetre in diameter, with distinct outlines of round, oval, or irregularly-angular shape, with rounded edges. Their interior was dissimilar and friable; they contained in their substance several opaque molecular granules, but never genuine *nuclei*. Acetic acid changed them little, and rendered them only something more transparent; in sulphuric acid they were partly dissolved with effervescence and formation of needle-like crystals. These bodies, therefore, possessed the general characters of tubercle-cells. They presented indeed perfect identity with pulmonary tubercles comparatively examined. The cells of the hepatic substance showed no change where they were not compressed by the tubercular masses. I regret much, as to this case, that I was unable to procure an accurate account of one of a female aged sixty years, who remained for a very short time in the hospital, and whose body, as it appears, was inspected in a hasty manner. I was indeed informed that the lungs contained no tubercles; but on this point I have by no means specific information.

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* Cruveilhier Anatomie Pathologique, Livraison xii. p. 1- -18.

2. The second case took place in a patient in my own practice.

A man, aged forty-five years, of robust frame, had enjoyed good health to his thirty-second year. After that time he began often to suffer from symptoms of rheumatism. During the last six years he had suffered from an attack of chronic *blepharitis*. During the last three years he had frequent pains in the abdomen and diarrhœa. For about two years he had frequently complained of pains in the right arm, which was feeble, and often suddenly refused to perform its duty. Sometimes speech was unsteady; the gait was tottering; often he had difficulty in voiding urine; his mental powers failed; and soon he entirely lost his memory, and paralysis of the right side took place. During the last nine months he had lost all mental energy, frequent convulsions took place, and gradually he fell into a state of complete stupor. Of pains in the head or in the region of the liver he had never complained. The patient was, in his last years, much addicted to drinking. In the last months, he had often difficulty in emptying the bladder, and the urine contained a muco-purulent sediment. He suffered from obstinate constipation. The right arm, especially the right hand, was in a state of such rigid contraction, that the nails had formed deep pits in the palm of the hand. Death ensued, without any particular acute symptoms, on the 9th of November 1841.

Inspection of the body disclosed the following state of parts:—

In the left side of the brain, in the *corpus striatum*, there was softening, considerable effusion of watery fluid within the ventricles, and venous injection of the membranes of the brain. The right kidney was in a state of inflammation. The sigmoid valves of the heart (aorta) were occupied by stony concretions. In several of the mesenteric glands, and particularly in the liver, tuberculosis had taken place to a very extensive degree. The patient had, nevertheless, presented no definite symptoms of this disorder. He had no cough. The lungs were sound. Nevertheless I had forgotten to notice this point, and therefore venture not from mere recollection to give it as certain. The stomach and intestinal canal were sound.

The diseased liver presented the following anatomical characters:—

The upper part of the right lobe adhered to the diaphragm, in which also tubercles were found. At the outer end of the right lobe were situate the tubercles least advanced, from the size of a pea to that of a hazel-nut, slightly convex, superficial, yellow, surrounded by a reddish vascular injection. Their consistence was that of the usual crude tubercles. On the surface of sections, they were yellowish-white, irregularly granular and friable, which gave them in spots an areolar appearance. Beneath the microscope the observer recognized, as the principal constituent part of these tubercles, small yellowish *corpuscula*, from 0.0075 parts of a millimetre to 0.01 part of a millimetre, without internal nucleus, with granules in their substance. Besides these were seen many fat vesicles, and everywhere around the tubercles considerable vascular injection. In many places were seen fragments of biliary *canaliculi;* and of these many were still in a state of good preservation. The most minute presented a diameter of about 0.00125 parts of a millimetre. At the upper part of the right lobe, in its entire substance, was a large tubercular mass of the size of the head of a child, five inches long, four inches broad, and two inches and a half thick, softened in the centre, and containing a capacious cavity. The walls of this cavity were from six to twenty lines thick; their surface was very irregular; the substance friable. The fluid contained in it was yellowish green, amounted to about eight ounces, and consisted of a quantity of molecular granules, of 0.0018 parts of a millimetre in size, and of small irregular *corpuscula*, from 0.005 to 0.0075 parts of a millimetre in diameter, only as yellow masses without determinate form, probably elements of bile. The fluid was otherwise viscid, and ropy like mucus. Nowhere did it contain *pus-corpuscula*. The bile in the gall-bladder was dark-brown, containing dark-yellow globules, 0.005 parts of a millimetre in diameter, and showing much cylinder-epithelium.

While, on the one hand, this observation appears important, and furnishes another proof, how, in doubtful cases of pathological anatomy, the microscope is the only means of furnishing decided results, yet here, nevertheless, we at the same time remark, that instances occur in which, even with this excellent instrument, the determination is not altogether easy; so that, in general, these researches appear to us after much practice more difficult; and, we perceive, not without deep regret, how much error microscopical observation, not quite exact, has not only already introduced into Natural History and Pathology, but is daily adding to these departments of science.

Thus, I have shortly detailed a case of cancer of the liver, in which, with distinct cancerous masses (enkephalomatous), were found large yellowish tubercular formations;—for this also I held it at first. But I soon discovered, that there were accumulated in greater amount, cancer-cells, in which the cell-membrane had for the most part fallen to the bottom, while only the deformed *nuclei* were left; which, not unlike the tubercular *corpuscula*, were nevertheless different from these, partly in size and partly in the residue of the cell-membrane. I have, besides, frequently observed cancer in the liver. It was for the most part skirrhus or enkephaloid growth; and on one occasion, I found in the gland, colloid cancer, which structure was observed in the same individual in the stomach and in the lungs.

The liver is further much more frequently the seat of fat-like degeneration, than of the tubercular depositions. In one case, however, I found both these forms of morbid change united. That in other respects the fatty transformation of the liver is not peculiar to tubercles, but often depends on different morbid states of the intestinal mucous membrane, I have been able sufficiently to convince myself. I observe here in passing, that usually the fat is deposited in proper cells in such amount, that a large proportion of hepatic cells, and also many blood-vessels, are thereby subjected to compression. Often this fatty deposition takes place in the interior of the liver-cells even,—a phenomenon which is not without important influence, in general, on the absorbing and imbibing energy of these cells, which assuredly perform a more considerable part than that of a mere parenchymatous element.

It is further remarkable, that in the tubercular morbid process, fat is often deposited in internal organs, particularly in the liver, while, on the contrary, it disappears in all other parts, in consequence of which circumstance, the names of phthisis, consumption, wasting, decay, decline, have been given in different languages to the tubercular disease, by reason of the remarkable degree of emaciation.

That the liver, however, is not the only organ in which fatty depositions take place, we learn from the important and excellent observations of Dr Bizot of Geneva, still little known in Germany. This author has not only observed a general decrease in the heart with attenuation of its walls, especially in the left ventricle; but he has described four important cases, all in females destroyed by phthisis, in which the anterior wall of the right ventricle, in its lower half, was transformed into a fatty texture, in which the muscular substance was pale, thin, and even as it appears partly absorbed. In all the four cases the liver was also affected with the fatty degeneration.

On tubercles in the kidneys and in the spleen, I have only the following facts to communicate. These I have for the most part observed only as secondary phenomena in general TUBERCULOSIS. Exceptions from this nevertheless occur; and of this the following instance of tubercles in the kidney furnishes a good example.

In the body of a female, aged forty-two years, only a few tubercles were found in the lungs, and a moderate amount of well-separated tubercular matter in the right kidney. The left kidney was considerably enlarged, and almost entirely converted into tubercular substance. From the cortical substances of the gland arose a thin layer sprinkled with crude tubercles; and the calyces formed as well as the whole interior of the kidney, a homogeneous, yellow, tubercular softened mass, diversified into considerable cavities, with irregular elevations.

In one case, I found in the body of a man, destroyed by pulmonary tubercles, a hypertrophied spleen, which was entirely traversed by yellow miliary tubercles lying close to each other.

VI.—ON TUBERCLES OF THE PERITONAEUM.

From the special treatises on TUBERCULOSIS, and still more from personal examination, we know that all parts of the PERITONAEUM, both individually and collectively, are liable to contain tubercles. We have often found them in the peritonæal investment of the diaphragm, of the liver, of the spleen, in the omentum, in the peritonæal covering of the abdominal muscles, and, in general, very frequently complicated with mesenteric tubercles, which belong to the class of glandular tubercles. Most commonly around peritoneal tubercles there is found a considerable development of colouring matter; and

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* Bizot, Memoires de la Societé Medicale et Observation, I. vol. p. 290–356.

melanosis is in this situation often so abundant, that, as I have already shown by example, the diseased organ presents an actual black and yellow speckled appearance.

Microscopical investigation demonstrates in tubercles of the peritonæum, besides the peculiar tubercle-cells, the presence of many fibres, which, however, is not to be ascribed to the tubercle secretion, but proceeds entirely from the fibres of the serous membrane, so that I have observed the same in the *pleura* and the *pia mater.* The tubercular corpuscula consequently kept to each other by fibres, easily at the beginning, as is the case in the lungs in similar circumstances, assume the aspect of semitransparent gray granulations, and become first yellow, as soon as by the continued tubercular excretion the fibrous element undergoes progressively great compression. I have never found tubercles of the *peritonæum* actually softened, the reason of which is probably this, that they do not, as in the lungs and the tuberculated intestinal tissue, meet with resistance, but may be developed long without hindrance, free, and excluded from all access of air. In the *peritonæum* alone they often excite inflammatory phenomena; and hence are formed false membranes, more or less purulent effusion, and even effusion of fecal matter, when those seated at the outer surface of the intestine advance in their development to the inner surface, and thus induce perforation.

The following short account of an example of the disease may show the different phenomena of tubercular *peritonitis.*

A young girl, aged thirteen years, of feeble corporeal frame, was for four months in the Children's Hospital at Paris. She had suffered from pains in the abdomen and diarrhœa, and was much emaciated. The belly was painful, a little distended, and felt doughy. The organs of respiration presented no particular morbid symptoms. During the last days of life the pain of the abdomen became suddenly considerable, the distension of the belly was much increased, fever was violent, sudden decomposition of the features, in short, all the symptoms of very acute perforating *peritonitis,* took place, and speedily put an end to life.

On inspection, we found the brain healthy. The lungs contained only some crude tubercles in the upper lobes.

In the abdominal cavity was found a quantity of yellow-gray fluid of puriform appearance. On the inner surface of the abdominal parietes, and also on the peritonæal surface of the intestines, were found false membranes, and around them a deeply-reddened, in many places, almost violet-coloured vascular injection. The fluid effusion possessed quite the characters of fecal intermixture; and, indeed, we found in the lower part of the *ileum*, a perforation which most probably had taken place from without inwards. The external surface of the intestines and abdominal *parietes*, were completely covered with tubercles of very different sizes. The intestinal mucous membrane contained few ulcerations, and around these intense vascular injection.

In the purulent fluid effusion mixed with fecal matter, were *pus-corpuscula*, as we have often had occasion to see these bodies in similar cases, almost disintegrated. Few were found entire; the greater part had been dissolved in molecular granules. In the false membranes were found only granulous coagulation. At the inflamed spots the peritonæum was thickened and softened; and at the outer surface of the intestines were found many greenish spots, surrounded by a violet-red elevated edge. These spots could be easily scraped off as granular detritus, and appeared to be gangrenous. In the effusion-fluid were found a quantity of crystals which probably had been effused from the cavity of the intestines. The deepest seated fibre layers of the thickened and inflamed *peritoneum*, presented a number of capillaries arranged in very arch-like tortuosities, and fibres in pretty good preservation. The tubercles at the peritonæal surface of the intestines were in general flat; they contained, however, with the tubercular *corpuscula*, peritonæal fibres. The largest were the size of a pea; the smallest were almost microscopical infiltration-specks. Nowhere did we observe them collected in great masses. In their interior I found several spots of crystals.

At the inner surface of the *cæcum* were found several cauliflower ramified vegetations about one inch long, which were vascular, and consisted of cellular tissue, mucous membrane, and very numerous black colouring-matter cells.

I mention here, further, two cases to which I shall afterwards revert. The first took place in a child of seven years, in whom, in consequence of tubercular *peritonitis*, perforation of the intestines had occurred, yet did not immediately terminate fatally, but presented a very remarkable termination in opening externally through the abdominal parietes, and thus by the formation of a fecal fistula and an artificial anus, prolonged the life of the child for some weeks.

The second case relates to the interesting fact of the simultaneous occurrence of cancer and tubercles in the peritonæum. Of this I shall afterwards speak.

VII.—ON TUBERCLES OF THE INTESTINES.

Tubercles of the intestines are found, as is known, particularly in the lower part of the *ileum*, and sometimes in the entire course of the colon. Their seat is uniformly the cellular tissue between the muscular coat and the mucous membrane. Those last considered, viz. those of the peritoneal covering, belong to the class of peritoneal tubercles. Their amount is often very considerable, sometimes very scanty; and in two instances only have I found in the whole intestine, only one individual tubercle in otherwise general Tuberculosis. The consistence of crude intestinal tubercles is normally less considerable than that of crude pulmonary tubercles. Beneath the microscope we for the most part find, yet only accidentally, mingled with them, cylinder-epithelium, and the *detritus* of mucous membrane. Often the mucous membrane is found to be very much attenuated before ulcerations are formed. In these I have never found purulent matter, even when softened at their basis, though disintegrated tubercular matter was found; and this fact must be received as another proof of the physiological difference between tubercular softening and ulceration on the one hand, and suppuration on the other.

In order to bring the different forms of intestinal ulceration before the reader in a distinct shape, I adduce here, from my history of cases, one which shows them on the most extensive scale, and in different modes.

A child of ten years of age had died at the Children s Hospital (*Hopital des Enfans*) at Paris, with all the symptoms of pulmonary and intestinal phthisis. On inspecting the body was found considerable destruction of the lungs by tubercular infiltration, and the formation of ulcerated cavities. In the abdomen was found a purulent and fecal effusion, in consequence of intestinal perforation resulting from an ulcer of the mucous membrane. The mesenteric glands were partly tuberculated, partly enlarged. The intestinal perforation was situate in the *ileum* near the *cæcum*. From the middle of the *ileum* to the anus was found a large amount of ulcers and intestinal tubercles in the different forms. The ulcers presented for the most part a sharply cut edge, and a yellowish base. In many was seen the muscular coat thickened, in others destroyed, and only a thin shred of peritonæum preventing perforation. The edge was in many instances blackish, irregular, elevated, containing many tubercles. The mucous membrane was softened all round; and around the larger ulcers were found a number of smaller ones. In many spots the solitary glands appeared slightly swelled. The glands of Peyer presented nothing morbid.

The intestinal tubercles presented the usual elements—in all much intermixture of fat. In the ragged fringed edges of many ulcers, the observer recognized in disintegration mucous membrane, many blood-vessels, much cylindrical epithelium, and a great quantity of fine granular substance. The redness surrounding the ulcers was not everywhere inflammatory redness; in many spots it was infiltration from the colouring matter of the blood. When, at the spots of the peritoneal membrane, where existed tubercles without ulceration, the observer examined these and the muscular coat, he saw in many points at the extremity irregular yellow specks of recently-secreted tubercular matter. Though at the bottom of the large ulcers, much tubercular matter was no longer found, yet this was distinctly presented by the very small ulcers which then closely surrounded the large ones.

In many spots the microscope demonstrated at the base of the large ulcers still the presence of tubercular-*corpuscula*, partly swelled, partly dissolved, where the naked eye observed no more tubercular substance. At the base of the ulcers were also found remains of muscular fibres, *detritus* of mucous membrane, mucus, epithelium-cylinders and their free *nuclei*, and new roundish epithelial-cells, which on superficial observation might be mistaken for *pus*-cells.

To the base of several extensive ulcers of the cæcum were attached pedunculated vegetations, from fifteen to eighteen millimetres long, and from six to eight millimetres in breadth. These consisted of a vascular mucous-membrane layer, of much tubercular substance, and a large amount of black pigment-cells; and therefore formed genuine melano-tubercular polypi. The deep-black pigment-cells were about 0.02 parts of a millimetre in size. In several of these swellings we observed the variegated aspect already described, only the mucous membrane gave the whole a more gray fundamental tint. Even in the interior of the tubercles pigment-globules were found.

VIII.—TUBERCLES IN THE WALL OF AN ARTERY.

In one instance only have I found tubercular matter deposited in the wall of a small artery. This was in the body of a child of two years, in whom many tubercles in the bronchial ganglia, in the *peritonæum,* in the intestines, and in the cerebral membranes, were found. A small artery in one of the cerebral commisures exhibited, on very careful dissection and microscopical examination, between the arterial walls, two small flat tubercles the size of a millimetre, and three still smaller speck-like depositions from one-fourth to one-third of a millimetre in size. Around this vessel were many tubercle-granulations, and into one of these I could easily trace a blood-vessel.

This example, the only one so far as I know of the kind known in science, shows that tubercular matter may be secreted immediately in the circulating system, without being previously exuded through the walls of the vessels in the tissue of organs. Certainly the usual course is to find tubercular *corpuscula* neither in the blood nor in the *parietes* of the blood-vessels; and, in general, even it is necessary that the pathological element, in order to be capable of exuding through the *parietes* of the blood-vessels, and thus being formed, should be previously contained dissolved in the blood, and that the pathological cells should first be deposited after excretion from the blood. Exceptions to this we nevertheless find, some of which I may here adduce.

1. Cruveilhier cites one case of medullary fungus in the interior of healthy veins.*

2. Gluge found in the right iliac vein medullary fungus globules in a clot of blood. The patient had died of medullary fungus in the stomach.†

3. In a mesenteric vein I found, in the body of an aged female destroyed by TUBERCULOSIS of the *peritonæum* and enkephaloid disease of the *peritonæum*, distinct medullary nodules, consisting internally of medullary fungus cells.

4. In the *endocardium* I found purulent matter in the middle of closed sacs.

5. In the middle of obliterated *coagula* of diseased vessels I have seen purulent matter. These instances are important, but may be regarded hitherto as exceptions.

IX.—TUBERCLES IN THE PERICARDIUM.

That tubercles are formed in the *pericardium*, and even in the substance of the heart, is not a new observation. Seldom, however, have they been seen to a so great extent with considerable change in form as in the following case.

A child, aged three years and a-half, died in consequence of tubercles in the lungs. On inspecting the body, I found externally œdematous infiltration of the face and lower extremities, and fluid within the cavity of the abdomen. The cerebral membranes were infiltrated with serous fluid, and presented intense venous injection. (It is proper to mention, that during life no cerebral symptoms had appeared.) But nothing morbid was found in the brain, except in each of the lateral ventricles a serous bag or bladder, nine lines long, enclosed by a vascular membrane,—a circumstance which in children is not uncommon.

On opening the cavity of the chest, we found between the ribs and the *pleura* considerable tubercular masses, and the same in the bronchial glands. Between the *pleura* and the lungs were gray granulations. The lungs contained few tubercles. In the abdomen, a considerable quantity of serous fluid was effused. The liver was very vascular.

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* Anatomie Pathologique Livraison, v. p. 3.

† Anatomische Mikroscopische Untersuchungen. March 1838. P. 106.

In the *peritonæum* were tubercles surrounded by melanosis.

The *pericardium* was closely agglutinated to the heart and all the surrounding parts. On the right side the pericardium was united to the right lung; at its superior margin with tubercular masses in the bronchial glands; in the adhesion-substance, between the pleura and pericardium, were found tubercles as large as the size of a hazel-nut.

The left ventricle lay almost flat on the diaphragm, to which also it was united by adhesion. The observer could trace distinctly vessels from the surface of the heart, probably proceeding from the coronary artery through the false membrane and the tuberculated pericardium to the surface of the lungs, forming, consequently, a new mode of anastomosis between the vessels of the pulmonary arteries and those of the aorta. At one spot tubercular matter was found between the muscular fibres of the heart.

The pericardium consisted of a yellowish lardaceous-looking mass, several lines thick, in which, by examination by the microscope, was proved the existence of a fibrous structure and a general tubercular infiltration.

This valuable preparation I have preserved in my anatomico-pathological collection.

In the *ileum* of this child was found hanging free into the cavity of the bowel a long pedunculated black swelling, eight lines in length and six lines broad, the surface of which was covered by a mucous membrane showing crystals, and the structure of which consisted of cell-fibres, and the peculiar substance of melanosis, tubercular masses, and blood-vessels, and contained besides fat-globules and caudate *corpuscula*.

Of tubercles in the uterus I lately saw one instance. On this, however, I have nothing particular to observe.

X.—ON EXTERNAL TUBERCULOUS FISTULÆ OF INTERNAL ORGANS.

I have observed some instances of the outward opening of internal tubercular masses. I regret that the limits, within which this essay must be confined, do not allow me to communicate these in detail from my papers; but I shall give here shortly the most important phenomena of four histories of this occurrence.

1. A female, aged twenty-three years, had on the right side of the neck, above the collar-bone, a wide open fistula, from which, during

expiration, air escaped with a rustling sound. On the sternum, in the region corresponding to the fourth rib, was a similar air-fistula six lines long; and a third was situate between the fourth and fifth ribs, one inch beyond the breast-bone.

On inspecting the body, there was found, three lines above the bifurcation of the *bronchi*, on the left side of the windpipe, an ulceration five lines long and three lines broad; and from this a fistulous canal, proceeding through a tuberculous gland, passed behind the trachea to the right side of the neck, and there made an external opening for itself. In the external pulmonary fistulæ, opening on the sternum and between the ribs, there opened bronchial tubes, which appeared to be sharply cut off.

2. In the body of a child of eight years, there was found, two fingers' breadth below the navel, an artificial anus, with considerable development of cutaneous follicles around the opening. In this canal opened the lower end of the *ileum*, near the cæcum. Between the principal fistula and the intestinal aperture was found a sort of cell-fibrous funnel-shaped pouch, with its basis directed to the bowel. The adhesions were effected by means of a quantity of fibro-cellular tissue. In the *peritonæum* and the intestines was a number of tubercles, and in the last ulcers. It appeared that, in consequence of an intestinal perforation of a tuberculous ulcer, amidst speedy limitation by means of adhesive inflammation, the external abdominal parietes had been ulcerated from within outwards, and thus had formed a fistula. The child lived after this several weeks, and died in consequence of general *tuberculosis.*

3. In a man aged thirty-one years, who was in the last stage of pulmonary consumption, and who presented, in many parts of the body, *caries* of the bones and ulcers of the soft parts, there was between the fourth and fifth ribs, on the right side of the sternum, an opening in the bones several lines in extent, with the skin over it left untouched, yet detached around to the extent of one inch. When pressure was made on this spot, the observer heard a crackling sound like that proceeding from the pressure of parchment. On coughing and expiration this spot was extruded; and it collapsed again during inspiration. By using the stethoscope the observer heard over the spot the sound of the tubular blowing. It seemed probable that a bronchial tube had been opened in the loss of substance in the sternum, and had been united to that bone by means of adhesive inflammation. The patient died; but it was not in my power to make an anatomical examination.

4. In a young female of seventeen years, there were in the left side of the neck several purulent fistulous openings, through which, during expiration and coughing, air and puriform mucus escaped. These fistulous apertures communicated with tubercular cavities

situate in the apex of the lung; and it appeared that this tissue existing between the tubercular glands of the neck and the apex of the lung had, in consequence of inflammation and suppuration, formed a communication between the two, and thus had formed the air-fistula in the neck.

XI.—ON THE SIMULTANEOUS OCCURRENCE OF TUBERCLES AND CARKINOMA.

It has been maintained that tubercles and carkinoma mutually exclude each other. This assertion is entirely erroneous. I have not only found both morbid processes taking place in the same individual, but I have also satisfied myself that the one is not developed at the expense of the other, because the one does not stop the other in its progressive advancement.

The following examples furnish proofs of the correctness of this statement:—

1. In a child of four years I found, with considerable cerebral and pulmonary tubercles, medullary fungus in the right kidney.

2. In a female aged sixty years, along with skirrhus of the mammary glands, of the liver, and the lungs, there were found softened tubercles in the apex of the left lung. The yellow cheesy-like appearance, and the peculiar tubercular *corpuscula*, readily distinguished these from the skirrhous cells contained in the fibrous stroma.

3. In the body of a female aged sixty-two years, I found in the lungs tubercles in different stages, and particularly in the upper lobe of the right lung an ulcerous cavity. In the *peritonæum* were found cancerous and tubercular masses in many places united. The carkinoma showed distinctly the elements of medullary fungus, of which were found small bodies like pin-heads up to masses the size of lentiles in one of the mesenteric veins. The tubercles were in the form of yellow cheesy-like friable infiltrated matter; and, both by the naked eye and the microscope, it was easily possible to distinguish this deposition from medullary fungus.

4. In one instance I found in the body of a female aged fifty-five years, a very considerable skirrhous tumour in the mammary gland; the carkinomatous fluid had been infiltrated into the *sternum*, and had formed in the mediastinum a considerable carkinomatous swelling, which had been agglutinated by adhesive inflammation to the upper lobes of both lungs. In these were found yellow cheesy-like tubercular infiltration, the elements of which the microscope rendered distinctly cognizable.

5. In a fifth case, I found in a skirrhous swelling of the mammary gland, yellow cheesy-like tubercles in several of the tubes of the milk-glands.

It is here requisite, as in laws of exception in general, to be very guarded in the expressions employed.

GENERAL CONCLUSIONS.

From the facts now communicated it seems reasonable to deduce the following inferences:—

1. Every formation which is pathologically different from any other formation manifests this difference even in its determinate microscopical structure.

2. The invariable elements of tubercle are—molecular granules; hyaline ligamentous or connecting matter; and the tubercle-cells peculiar to tubercle, from 0.005 parts of a millimetre to 0.01 part of a millimetre in diameter, irregular in shape, containing in their substance no *nuclei*, but molecular granules. In water, ether, and weak acids, they undergo almost no change; in the concentrated alkalis, as *liquor ammoniæ causticus* and *aqua potassæ*, they are completely dissolved.

3. The dimensions of the tubercle-cells are liable to manifold variations, which however depend neither on differences in organs nor on differences in ages. They are most easily discovered in yellow crude tubercles.

4. Tubercular *corpuscula* are cells left remaining at a low stage of development.

5. The view that tubercular substance is a modification of purulent matter is most decidedly contradicted by microscopical examination.

6. Tubercular *corpuscula* are distinguished from imperfect *pus*-globules by the spherical shape of the latter and by their larger diameter; from perfect *pus*-globules by the *nuclei* appearing in the latter; lastly, from carkinoma-cells distinctly by this character, that the latter are from two to four times as large, and consist of a cell-membrane, of a large distinct *nucleus*, and often even of *nucleoli*.

7. In the softening process in tubercle the connecting matter is fluid; the *corpuscula* are rounded off; their close juxtaposition ceases; they become expanded, and seem to be large. This, however, is not growth, but incipient disintegration.

8. The purulent matter surrounding softened tubercle never has its origin in the tubercle itself, but uniformly in the parts immediately surrounding it.

9. The microscope is capable in doubtful cases of distinguishing whether the observer has to do with softened tubercle, or with thickened purulent matter, or with a mixture of the two.

10. Purulent matter appears rapidly to cause the disintegration of tubercular *corpuscula*, and therefore to render them not cognizable in their individuality.

11. While irregularity in outline and compressed mutual aggregation indicate the first stage in the development of tubercle-cells, and mutual softening, expansion, and rounding off denote the second stage, so the third stage consists in solution. The minute globes are separated into a semifluid granular mass, and lose their individuality.

12. The induration and the calcareous transformation of tubercle is one mode of natural cure. The peculiar tubercular elements are wasted, and are partly absorbed. In their place are substituted small mineral granules, and sometimes crystals of cholesterine. The process of calcareous transformation is usually attended by deposition of colouring matter. According to the chemical analysis of M. T. Boudet, the chief elements found in these calcareous fragments are chloride of sodium and sulphate of soda. Calcareous salts are only in small amount.

13. In tubercles, we specify, as elements not constantly but occasionally present, melanosis as the most frequent admixture; and, next to this, fat, fibres, olive-coloured dark globules, and crystals. We find, as only accidentally mingled with tubercles but by no means belonging to their substance, the products of inflammation, as exudation and suppuration, and the elements of epithelium-fragments in multiplied forms.

14. The seat of tubercle in the lungs is usually the elastic cellular tissue of these organs. These bodies are however also found secreted in the pulmonic vesicles, and in the capillary or minute bronchial tubes.

15. The pulmonic tissue around tubercles may be sound; but for the most part it is in the state of congestion or of inflammation. The latter morbid process is either lobular or diffused over the greater part of an entire lobe.

16. The purulent matter found surrounding tubercles is often not the consequence of gray hepatization, but proceeds from the mucous membrane of the small bronchial tubes, partly destroyed and opening in the tissue of the lungs.

17. Pneumonia around tubercles possesses nothing specific. We find in it the same elements of exudation, aggregation globules, fat-vesicles, purulent *corpuscula*, &c., as in ordinary pneumonia. Tubercular *corpuscula* are found usually not among exudation products.

18. Occasionally there is found around tubercles a peculiar form of chronic inflammation, with yellowish hepatization and with increased consistence in texture. The pulmonic vesicles, the small bronchial tubes, and the pulmonic tissue are filled partly with fibrinous coagula with new fibrous formation, partly with aggregate and purulent globules; and amidst chronic hepatization with few vessels, we find vascular acute lobular pneumonia.

19. The degree of consistence of acutely or chronically inflamed lungs depends on the amount of fibrinous matter, fluid blastema, and globules contained. Much fibrinous matter, with little blastema and few globules, produces induration; much fluid blastema with few globules produces softening. Equal proportions of these different elements produce a middle degree of consistence.

20. The lungs rendered compact in consequence of compression from above by pleuritic effusion, often present nowhere any inflammatory phenomena.

21. The gray semitransparent granulations of the pulmonic tissue contain from the beginning tubercle-cells, and are therefore a genuine form of tubercle. Their colouring and transparency is produced partly by the close juxtaposition of the tubercular *corpuscula*, in consequence of uninjured pulmonary fibres, partly by the presence of a large proportion of connecting matter.

22. The gray granulation is not always the termination of the formation of yellow tubercles. The latter is often developed primarily as such.

23. The vascular net-works found around the gray granulations are neither signs of inflammation nor consequences of new formation, but rather effects of the compression of many capillaries by the tubercular deposition and the consequent over-distension of the residual capillary vessels reduced in amount.

24. The notion that gray granulation may be a consequence of inflammation, is contradicted by correct research.

25. The process of ulceration is altogether different from that of suppuration. Thus we find on the mucous membrane of the *bronchi* suppuration without the formation of ulcers, and on the mucous membrane of the intestines, ulcers without suppuration. The last cause of ulceration is effected by inflammation, in consequence of parasitical deposits, occasionally from obliteration of a certain order of capillary vessels produced by causes hitherto unknown.

26. The tubercular ulcer of the lungs is physiologically not different from the tubercular ulcer of the bowels and of the skin.

27. In TUBERCULOSIS, a general ulcerous diathesis is formed, particularly in organs in which tubercles very rarely take place. This is a manifest result of the researches of Louis.

28. The internal fluid layer of the contents of ulcerous cavities of the lungs contains the following elements; 1. tubercular substance, seldom entire, for the most part globules in the process of expansion, or in that of granular dissolution; 2. *pus*-globules, occasionally in smaller amount; 3. puride-globules; 4. aggregation globules; 5. purulent mucus; 6. blood-globules;

7. pulmonary fibres; 8. black colouring matter, or melanotic deposits; 9. epithelial fragments; 10. occasionally crystals; and, 11. adipose tissue.

29. Among this thickish fluid are found, for the most part, false membranes, consisting of fibrinous matter enclosing purulent elements.

30. Among the false membranes covering the diseased pulmonic tissue is found a true purulent membrane, consisting of vessels and a fibrous basement membrane enclosing minute globules. This is usually partly destroyed by fresh tubercular eruptions taking place amidst it.

31. This membrane is the result of a healing effort of nature, in order to isolate the ulcerated pulmonic tissue, and thereby to favour its cicatrization.

32. Between the purulent membrane and the pulmonic tissue is often found a layer of newly-formed fibrous tissue.

33. Around the ulcerated cavities deposits of new crude tubercles for the most part take place.

34. The healing of cavities is accomplished, 1st, by the isolating faculty of the purulent membrane, and the contracting circumscription of the cavities; 2d, by deposit of fibrinous matter which fills the cavities, unites with their walls, and thus forms a fibrous cicatrix; and, 3d, by deposition of saline matter* in the cavities, and formation of fibrous tissue around them.

35. There are no such formations as *mucus-corpuscula*; what have been described as such are merely *pus-corpuscula* secreted by diseased mucous membranes. Proofs of purulent matter are therefore useless.

36. In the expectoration of phthisical persons are found the following elements: 1. mucus; 2. *pus-corpuscula*, uniformly in larger quantity; these are occasionally found in a shrivelled state, and may then readily occasion error; 3. epithelial fragments in the different forms; 4. granular matter in greater quantity, consisting probably of dissolved tubercular *corpuscula*; 5. small yellow pellicles, portions of false membranes; 6. pulmonary fibres; 7. adipose vesicles; 8. blood-globules, occasionally with fibrinous coagula; 9. aggregation-globules; 10. small infusoria, or vibriones, yet rarely and only accidentally.

37. Proper tubercle-cells are usually not found in the expec-

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* The author repeatedly terms this deposition mineral; yet he allows that chemical analysis proves the existence of chloride of sodium and sulphate of soda, with a trace of lime. There is no doubt that in one sense these are mineral substances. But it seems more correct to apply to them the simple character of saline, which means no more than that the materials may be either alkaline salts or earthy salts.

toration of phthisical persons. There is, accordingly, no uniform or certain indication by which to distinguish the expectoration of pulmonary consumption from that of other diseases.

38. Pulmonic fibres in the expectoration denote the presence of ulcerated cavity. Their occurrence is, nevertheless, rather exceptional than constant.

39. The greatest part of the expectoration of phthisical patients proceeds not from cavities, but is secreted by the *bronchi*.

40. The abundant secretion of mucus and purulent matter, often taking place from the *bronchi* in pulmonary consumption, is one of the ways which nature strikes out, in order to prevent greater disturbance in the circulation, which would be a necessary consequence of the imperviousness of one set of capillaries, and the over-distension of the rest.

41. One part of the dissolved tubercles of the ulcerated cavities is mingled with the expectoration, another part is absorbed.

42. The law enunciated by Louis, that, after the age of fifteen years, the lungs contain tubercles, if they are found in other organs, is, on the whole, correct. It may, nevertheless, be modified in this manner, that, provided in any other organ a very considerable deposition of tubercles takes place, for instance in the liver, the kidneys, the *peritonæum*, the lungs often contain few tubercles.

43. In childhood, tubercles in the cerebral membranes, in the glandular system, and in the peritonæum, are more frequent than in adults.

44. The thickening of the *pleura*, from pulmonary tubercles, has its cause, not in inflammation, but in increased nutrition, since it becomes more vascular, in so far as it receives a portion of the pulmonary blood, and therefore becomes a supplemental organ to the circulation through the lungs, and at the same time, by agglutination with the walls of the chest, enlarges the anastatic communications with the large circulation.

45. From embryological and pathological researches, it results that neither around tubercles, nor in the false membranes of the pleura, are new vessels formed independent of the general circulation. Uniformly, new vessels are formed in diseases in the centrifugal direction from the large circulation.

46. The apparent conversion of false membranes into cartilaginous substance depends only on the fibrousness of compression without secretion of proper cartilaginous elements. In like manner, the so-named ossification of false membranes consists only in amorphous deposition of mineral formations.

47. The three chief forms of glandular tubercles are those of the superficial or subcutaneous glands, the bronchial glands, and

the mesenteric glands. The last possess least tendency to softening.

48. Tubercular matter is, in the glands throughout, the same as in other organs.

49. The existence of a sensible demonstrable scrofulous matter we cannot admit. That which is regarded as such is either the consequence of ordinary inflammation or suppuration, under the influence, no doubt, of a dyscrysial element, yet without peculiar matter, or of inflammation and suppuration, attended by tubercular deposition.

50. Tuberculosis is, in the osseous system, a much rarer disease than observers are disposed at present to allow. Very frequently concrete purulent matter and tubercular matter are in this case confounded with each other. In doubtful cases the microscope alone can establish the diagnosis.

51. From actually scrophulous diseases, which, for the most part, become known by inflammation-products and suppuration, tubercular diseases, on the one side, are to be distinguished, and, on the other, chronic idiopathic inflammation of the eyes, of the skin, of the glands, of the bones, of the joints. The last category often in children is alternated with *scrofulosis*.

52. In short, accurate diagnosis and definite conceptions of *Scrofulosis* is a desideratum daily more urgently demanded in modern medical practice.

53. The gray granulations in the cerebral membranes, particularly the *pia mater*, show distinctly tubercular *corpuscula* between the fibres of the serous membrane. They further appear in the brain frequently with yellow miliary tubercles, with tubercular infiltration, and also along with large tubercles.

54. In the liver tubercles appear occasionally in very considerable masses, and even with true cavities. These cases are readily confounded with cancer, so far as the medullary fungus of the liver, examined when converted into softening and disintegration, has often an appearance very similar to tubercular deposition.

55. Besides fatty deposition in the liver, fatty degeneration in the heart occasionally takes place in phthisis; consequently a tendency to the deposition of fat in internal organs, while it undergoes wasting in most parts, particularly the external, forms a pathological character of tubercular and other diseases.

56. The kidneys may also be almost quite filled with tubercular deposition. In cases of this class, few tubercles are found in the lungs.

57. In tubercles of the *peritonæum*, we find among the tubercular *corpuscula* many fibres of serous membrane. Tubercles of the *peritonæum* are little disposed to softening. They are, for the most part, accompanied by considerable deposition of colouring matter.

58. *Tuberculosis* of the peritonæum occasionally causes perforation of the intestine, which is for the most part fatal. Yet, in instances of the greatest rarity, by means of the formation of an artificial anus, the preservation of life is still permitted.

59. The consistence of crude intestinal tubercles is normally less firm than that of other organs. In the tubercular ulcers of the intestines no purulent matter is found.

60. The microscopical elements of tubercular intestinal ulcers are, besides the disintegrated tubercle-cells;—cylinder-epithelial fragments, granular disintegrated mucous membrane, and remains of fibres and *fasciculi* of the muscular coat. The new epithelial cells should not be confounded with *pus-corpuscula.*

61. On the morbid intestinal mucous membrane of phthisical persons, we find occasionally polypiform, melanotic, and tubercular excrescences.

62. Tubercles are found, in very rare cases, deposited between the walls of the arteries;—a fact most important in favour of the excretion of tubercles from the blood.

63. In the *pericardium* and in the heart tubercles are found. There are formed, in that case, very extensive adhesions and vascular anastomoses, between the branches of the coronary artery and those of the surface of the lungs;—a remarkable communication between the vessels of the large and the small circulation.

64. Tubercles in the thoracic organs, as well as those in the abdominal organs, may open passages externally, and thus form pulmonary air-*fistulæ*, as well as intestinal *fistulæ.*

65. Tubercles and carkinoma do not mutually exclude each other, and therefore do not arrest each other's progress. Both morbid processes may, at the same time, run their several stages of development in the same individual.

ART. V.—*View of the Sickness and Mortality in the Royal Infirmary of Glasgow during the Year* 1847: *Illustrated by Tables of the different Diseases.* By JOHN CHARLES STEELE, Surgeon, Superintendent of the Royal Infirmary, Glasgow.

IN contributing the present series of statistics to the records of hospital experience, I have been influenced by a wish to continue and extend the numerical analysis of the cases treated in the Glasgow Royal Infirmary, which was commenced in 1844 by my predecessor Dr ORR; being convinced that it is the only method by which we can solve and elucidate many of the most important questions connected with the practice of medicine and surgery. The arrangement adopted in the following tables is in most respects similar to that employed in the series of statistics for the three preceding years; but the greater amount of fever cases treated in connexion with the Infirmary during 1847 has rendered it necessary to devote a larger space for the consideration of the data and returns as furnished during the progress of the epidemic. The accommodation afforded by the Fever Hospital—on ordinary occasions perfectly sufficient to supply medical relief to the afflicted poor—was found totally inadequate to meet the emergency; auxiliary hospitals and temporary fever-sheds were brought into requisition through the separate exertions of the managers of the Infirmary and the parochial authorities; and notwithstanding every available measure was taken for arresting the progress of the disease, the extent and severity of its ravages far superseded the results of any previous visitation.

The additional accommodation in connection with the Infirmary consisted in the reception of fever patients into the hospital in Rottenrow, which was opened on the 25th of January, and closed on the 19th of July, giving the benefit of medical treatment to 578 female fever patients. In addition to this, a temporary wooden shed, capable of containing 140 beds, was erected on the hospital green, and opened for the admission of cases on the 24th June. The fever-shed was closed on the 24th February of the present year, after giving admission and treatment to 407 patients, and has since been unoccupied.

In the accompanying tables, the numbers treated in these auxiliary establishments have been added to the total treated in the Fever Hospital in more immediate connection with the Infirmary, so as to form an aggregate of the whole fever cases. The annexed abstract will exhibit the total movement in the whole institution during 1847.

Remaining 1st January 1847 (from former year),		412
Admitted since to 1st January 1848,		7561
Total treated,		7973
Dismissed cured,	5748	
Relieved, &c.,	713	
Died,	1146	
Remaining 1st January 1848,	366	
Total cases,		7973

Medical and Surgical Wards.		
Remaining 1st January 1847,		180
Admitted since,		2375
Total treated,		2555
Dismissed cured,	1328	
Relieved, &c.,	713	
Died,	342	
Remaining 1st Jan. 1848,	172	
Total Cases,		2555

Fever Wards.		
Remaining 1st January 1847,		232
Admitted since,		5186
Total treated,		5418
Dismissed cured,	4420	
Died,	804	
Remaining 1st January 1848,	194	
Total Cases,		5418

This general estimate exhibits, from a comparison with last year's returns, a decrease in the admissions of medical and surgical cases, while the mortality considerably exceeds that of the former year. In the fever department, the numbers remaining at the end of the year show a sensible decrease from those resident in the house at the beginning of the year, when fever was increasing rapidly; while the intervening admissions abundantly testify to the progress of the epidemic.

I.—STATISTICS OF THE MEDICAL AND SURGICAL WARDS.

The number of patients remaining in these wards on the 1st of January 1847 from the preceding year, amounted to 180; there were admitted during the year 2375, while there remained in this department on the 1st January 1848, 172; leaving a total of 2383 whose cases have been treated to a termination. Of this number 1561 were males, and 822 were females; of the former, 228 died; of the latter, 114 died.

In the medical wards alone the cases treated to a termination amounted to 1298, 737 being males, while 561 were females. Of the former, 135, or 1 in 5.4, died; of the latter, 82, or 1 in 6.8, died; and of the whole number, 217, or 1 in 5.9, died.

In the surgical wards the cases treated to a termination were 1085, 824 being males, while 261 were females. Of the former, 93, or 1 in 8.8, died; of the latter, 32, or 1 in 8.1, died; and of the whole number, 125, or 1 in 8.6, died.

Before proceeding to specify the various diseases for which the patients were treated, a casual glance at the following table will enable us to judge of the admissions, dismissions, and relative mortality for each month of the year.

TABLE I.—Monthly returns of Medical and Surgical Wards.

Mon. 1847.	Admitted.			Dismissed.			Died.			Aver. No. in Hospital.			Mortality per cent.		
	Tot.	M.	F.	Tot.	M.	F.	Tot	M.	F.	Tot	M.	F.	Tot.	M.	F.
Jan.....	241	147	94	169	114	55	45	30	15	199	121	78	18·25	20·40	15·95
Feb.....	202	126	76	187	113	74	29	21	8	202	120	82	14·35	16·66	10·52
March,	237	158	79	197	122	75	26	18	8	202	127	75	10·97	11·39	10·12
April,	226	146	80	201	126	75	32	22	10	209	129	80	14·16	15·07	12·5
May,...	219	154	65	197	127	70	29	22	7	191	133	58	13·24	14·28	10·76
June,	178	124	54	180	131	49	31	20	11	182	129	53	17·41	16·12	20·37
July,...	168	116	52	160	111	49	23	18	5	152	103	49	13·69	15·51	9·61
Aug...	172	109	63	134	88	46	26	16	10	149	102	47	15·11	14·67	15·87
Sept....	178	118	68	147	101	46	26	16	10	162	100	62	14·51	13.56	16·56
Oct.....	164	107	57	144	94	50	17	14	3	164	105	59	10·36	13·08	5·26
Nov....	212	137	75	155	100	55	23	11	12	183	114	69	10·85	8·03	16·
Dec. ...	178	118	60	170	106	64	35	20	15	148	116	32	19·66	16·96	25·
Total,	2375	1560	815	2041	1333	708	342	228	114	178	116	62	14.4	14·62	13·98

TABLE II. presents an abstract of the different cases treated in the medical and surgical wards during 1847, specifying the diseases, mortality, &c.

Diseases.	Case	Cured.		Reliev.		Dismis. fm. oth. causes.		Died.		Mortality per cent.			Aver. residence.	
	Tot.	M.	F.	M	F.	M.	F.	M	F.	Tot.	M.	F.	M	F.
I.* Fevers.														
Epidemic Fever,	32	10	6	...	...	8	4	3	1	12·5	14·2	9·	13	17
Typhus fever,	19	1	4	...	...	3	5	4	2	32·1	50·	18·1	26	18
Dothinenteritis,	18	4	8	...	...	2	1	2	1	16·6	25·	10·	26	23
Febricula,	6	3	3	...	...	...	...	...	...	...	...	...	7	11
Intermittent fever,	4	4	...	...	...	...	...	...	...	...	...	...	10	...
Scarlatina,	1	...	1	...	...	...	..	...	...	...	..	...	...	17
Variola,	1	1	...	..	...	...	...	...	...	...	...	...	11	...
Total,	81	23	22	...	...	13	10	9	4	16·	20·	11.1	...	...
II. Nervous System.														
Apoplexy,	2	1	...	...	...	...	..	1	...	50·	100·	...	36	...
Brain, disease of,	5	1	..	...	...	...	1	3	...	60·	300·	...	11	74
——— compression of,	1	...	...	...	...	...	...	1	...	100·	100·	...	8	...
——— concussion of,	4	3	1	..	...	...	...	...	...	...	...	...	9	8
Cramp,	1	...	1	...	...	...	...	...	...	...	...	...	...	8
Delirium Tremens,	9	6	...	...	...	...	...	3	...	33·3	50·	...	45	..
Dementia,	1	...	...	...	...	1	...	...	...	..	...	...	8	...
Epilepsy,	7	1	...	2	1	...	1	1	1	28·5	25·	33.3	7	12
Hemiplegia,	13	3	1	3	2	...	2	1	1	15·3	14·	16.6	40	48
Hydrocephalus,	1	...	...	...	...	...	1	...	...	...	...	...	...	26
Hypochondriasis,	2	..	...	1	1	...	...	...	...	...	...	..	23	26
Hysteria,	9	...	5	...	4	...	...	...	...	...	...	..	...	25
Melancholia,	2	...	...	...	...	1	1	...	...	...	...	...	14	17
Neuralgia,	6	1	...	1	1	2	1	...	...	...	...	...	20	26
Paralysis, general,	12	3	1	3	1	2	1	1	...	8·3	11·1	...	36	30
——— partial,	10	4	1	3	2	...	2	...	..	...	...	...	36	33
Paraplegia,	11	5	...	...	1	1	...	2	..	18·1	25.	..	49	93
Sciatica,	3	1	...	2	...	..	...	...	...	...	...	...	25	...
Spinal irritation,	6	0	3	...	1	...	2	...	...	...	...	...	..	35
Spine, concussion of	1	1	...	...	...	...	...	...	...	..	...	..	9	.
Tetanus,	3	...	...	...	...	...	...	2	1	100.	66·6	33·3	7	2
Tic doloureux,	1	...	...	1	...	...	...	...	...	...	...	...	37	...
Vertigo and headach,	5	2	2	...	..	1	...	...	...	...	...	...	24	11
Total,	115	32	15	16	14	8	12	15	3	15·6	21·1	6.8	...	...
III. Circulatory System.														
Aneurism of aorta.	1	...	...	...	...	...	...	1	...	100·	100·	...	49	...
——— popliteal arty.	1	1	...	...	...	...	...	...	...	...	...	...	57	..
Aneurismal varix,	1	...	...	...	...	...	1	.	...	...	...	...	...	12
Angina pectoris,	1	...	...	..	...	1	...	...	...	...	...	...	5	..
Cachexy,	1	..	...	...	...	1	...	...	...	...	...	...	7	...
Cardiac dropsy,	30	3	3	7	5	...	...	5	7	40·	33·3	46·6	24	27
Heart disease,	61	...	5	14	16	1	4	12	9	34·4	44·4	26·4	41	19
Hæmorrhoids,	4	2	...	1	...	...	1	...	...	...	...	...	20	6
Phlebitis idiopathic.	1	...	...	...	...	..	...	1	...	100·	100·	...	10	..
——— meningeal,	1	...	..	..	...	...	...	1	...	100·	100·	...	9	...

* The cases of fever dismissed from other causes were sent to the fever wards.

Diseases.	Case.	Cured.		Re-liev.		Dismis. fm. oth. causes.		Died.		Mortality per cent.			Aver. resi-dence.	
	Tot.	M.	F.	M	F.	M.	F.	M	F.	Tot.	M.	F.	M.	F.
Purpura,	15	11	1	...	...	1	...	1	1	13·3	7·6	50·	29	7
Scorbutus,	102	63	15	18	4	5	...	...	1	·9	...	5·	27	92
Varicose veins,	1	...	...	...	1	...	...	..	...	...	...	...	...	30
Total,	220	81	24	35	26	9	6	21	18	17.7	14·3	24·3	...	...
IV. Respiratory System.														
Asthma and emph. pul.	8	1	...	1	2	1	...	2	1	37·5	40·	33·3	26	10
Bronchitis,	101	37	28	8	6	1	3	12	6	17·8	20·7	14·	21	22
Catarrh,	3	3	...	...	...	...	...	...	...	..	...	...	12	...
Empyema,	1	...	...	...	...	...	...	1	..	100·	100·	...	3	...
Gangrene, pulmonary,	1	...	...	...	...	...	...	1	...	100·	100·	...	22	..
Hæmoptysis,	3	1	...	1	...	...	...	1	..	33·3	33·3	...	13	...
Hydrothorax,	5	5	...	...	...	...	..	...	...	...	...	...	37	...
Laryngitis,	5	2	1	...	1	...	...	...	1	20·	...	33·3	25	25
Phthisis,	79	...	...	27	11	16	5	13	7	25·3	23·2	30·4	21	33
Pleurisy,	22	14	2	1	1	...	...	3	1	18 1	16·6	25·	33	22
Pleuropneumonia,	7	6	...	...	. .	...	...	1	...	14·2	14·2	...	22	..
Pneumonia,	31	11	3	2	...	3	1	10	1	32·2	34·6	20·	21	24
Pulmonary apoplexy,	1	...	...	...	..	...	..	1	...	100·	100·	...	20	...
Total,	267	80	34	40	21	21	9	45	17	23·2	24·1	20·9	...	...
V. Genito-Urinary Syst.														
Amenorrhœa,	2	...	1	...	1	...	...	...	...	.	...	...	...	28
Bladder, disease of,	11	2	...	5	1	2	...	1	.	9·	10·	...	20	16
Calculus in urethra,	2	2	...	...	...	...	...	...	...	...	..	..	26	..
——————vesica,	14	7	3	...	...	3	.	1	...	7·1	9·	...	24	20
Cancer of labia,	1	...	1	...	...	...	...	...	...	...	...	...	...	80
——— uterus,	1	...	...	...	.	...	...	...	1	100·	...	100·	...	...
Chlorosis,	3	...	1	0	1	...	1	...	...	...	...	...	...	21
Diabetes insipidus,	3	1	...	1	...	...	1	..	...	..	...	..	28	27
——— mellitus,	4	1	...	...	1	1	1	...	...	...	..	...	24	38
Fistula, recto-vaginal,	1	...	..	...	...	...	1	..	...	...	...	..	.	24
——— urinary,	2	..	...	...	...	1	...	1	...	50·	50·	...	34	...
——— vesico-vaginal,	4	...	1	...	..	...	3	...	..	...	...	...	...	24
Gonorrhœa,	3	1	1	...	...	1	...	...	...	. .	...	...	20	22
Hematocele,	2	2	...	...	...	...	...	...	...	...	...	...	48	...
Hæmaturia,	2	...	1	..	...	1	...	...	.	...	...	...	13	40
Hydrocele,	10	6	...	2	...	2	...	...	..	...	...	...	19	...
Hydrosarcocele,	2	1	...	1	...	...	..	...	...	...	..	...	33	...
Injury of pudenda,	1	...	1	...	...	...	...	...	..	...	...	...	...	14
Leucorrhœa,	3	...	2	...	1	...	..	...	...	..	...	...	...	25
Menorrhagia,	3	...	2	0	1	...	...	..	...	...	...	...	...	24
Orchitis.	8	5	...	1	...	2	...	..	...	...	..	...	16	..
Ovarian disease,	6	...	...	0	4	...	2	...	...	...	...	...	...	37
Prolapsus vaginae,	1	...	...	...	1	...	..	...	...	.	. .	...	..	22
Prostatic disease,	2	1	...	...	...	..	...	1	...	50·	50·	...	17	...
Puerperal convulsions,	1	...	1	...	...	...	...	...	...	...	...	...	...	16
Scrotum, disease of,	4	2	...	.	..	1	...	1	...	25·	...	...	34	...
Syphilis, congenital,	1	..	...	..	...	...	...	..	1	100·	...	100·	.	2
——— primary,	24	16	6	...	...	2	...	...	.	...	...	...	25	34
——— secondary,	64	16	24	8	6	6	4	...	...	...	...	...	25	36
Testicle, disease of,	6	2	...	2	...	2	...	...	...	...	...	...	30	...
Urethra, injury of,	4	1	1	...	...	...	..	2	...	50·	66·6	...	23	21
——— stricture of,	15	4	...	5	..	5	...	1	...	6·6	6·6	..	28	...
Urine, incontinence of	4	1	..	3	...	...	...	...	...	..	...	...	38	...

Diseases.	Case.	Cured.		Re-liev.		Dismis. fm. oth. causes.		Died.		Mortality per cent.			Aver. resi-dence.	
	Tot.	M.	F.	M	F.	M.	F.	M	F.	Tot.	M.	F.	M	F.
Urine, retention of	2	1	...	..	1	...	..	...	...	...	...	...	16	54
Uterus, disease of,	4	...	...	...	1	...	2	...	1	25·	...	25·	...	20
——— polypus of,	1	...	1	. .	...	...	...	...	...	...	...	...	...	47
——— hæmorr. from,	1	...	1	...	...	...	...	...	...	...	...	...	...	5
——— retroversion of,	1	...	...	...	1	...	...	...	...	...	..	...	...	27
Total,	223	72	48	28	20	29	15	8	3	4·9	5·8	3·4	...	...
VI. Glan. and Sec. Sys.														
Abscess of abdmnl. par.	3	3	...	...	...	...	...	...	...	..	...	...	17	...
——— of axilla & arm,	3	3	...	...	...	...	...	...	...	..	...	...	24	...
——— of back,	5	...	1	...	1	3	...	...	...	...	..	...	14	11
——— of foot,	1	1	...	...	...	...	...	...	...	...	...	...	18	...
——— of leg and thigh,	7	4	3	...	...	. .	...	...	...	...	...	...	26	17
——— of lumb. & pelv.	9	2	4	2	..	1	...	...	...	...	...	...	20	18
——— of mamma,	1	...	1	...	...	...	...	...	...	...	..	...	...	8
——— of neck,	1	1	...	...	.	...	...	...	...	...	. .	...	32	...
——— of thoracic par.	1	1	..	...	...	...	...	...	...	...	...	...	21	...
Bronchocele,	2	...	..	...	1	...	1	..	..	...	...	...	...	19
Erethismus mercurialis,	3	...	...	...	...	...	2	1	...	33·3	100·	...	3	1
Dis. axil. & inguil. glds.	7	3	1	...	...	2	...	..	1	14·2	...	50·	30	10
—— kidney,	4	1	1	...	2	...	...	...	...	...	...	...	13	33
—— liver,	10	2	1	5	...	1	...	.	1	10·	...	50·	46	21
—— mamma,	2	0	0	.	...	...	2	...	...	...	...	...	...	5
—— Peyer's glands,	1	0	0	...	1	...	...	...	...	..	...	...	...	29
—— spleen,	2	.	...	...	...	1	1	...	...	...	...	...	8	43
Icterus,	3	1	1	...	...	...	...	...	1	33·3	...	50·	6	24
Hepatitis,	2	...	...	...	...	1	...	...	1	50·	...	100·	24	33
Hepatic dropsy,	5	2	1	...	...	...	...	1	1	40·	33·3	50·	27	19
Mamma, cancer of	8	0	3	...	...	...	3	...	2	25·	...	25·	...	28
Nephritis,	2	1	1	..	...	...	..	..	...	...	...	...	10	4
Renal dropsy,	25	10	1	5	2	1	...	3	3	24·	15·7	50·	31	34
Struma,	33	6	...	7	3	10	4	2	1	9·	8·	12·5	27	37
Total,	140	41	19	19	10	20	13	7	11	12·8	8·	20·7	...	...
VII. Integ. System.														
Anasarca,	28	10	9	1	4	1	...	2	1	10·7	14·2	7·1	23	24
Bed sores,	5	...	2	1	...	..	...	1	1	40·	50·3	33·3	30	21
Carbuncle,	3	1	...	1	...	...	...	1	...	33·3	33·	...	10	...
Cicatrix from burn,	5	1	...	1	...	3	...	...	..	...	...	. .	25	...
Chilblains,	1	...	1	...	...	..	...	...	...	...	...	...	...	11
Cutaneous cancer,	1	1	...	...	...	...	...	. .	...	...	...	...	53	...
Ecchymosis,	1	1	..	...	..	...	.	...	...	...	...	...	52	...
Eczema,	5	2	...	...	2	.	..	...	1	20·	. .	33·3	30	46
Elephantiasis,	1	...	..	1	...	...	...	...	...	...	...	...	86	...
Erysipelas,	35	13	13	1	...	2	...	4	2	17·1	20·	13·3	23	29
Erythema,	5	1	4	..	...	...	...	...	...	...	...	...	30	44
Herpes,	1	1	...	...	..	. .	...	...	...	...	...	...	23	...
Ichthyosis,	1	...	...	..	1	...	...	..	...	...	..	...	..	36
Impetigo,	2	...	...	...	1	1	..	..	...	...	...	...	1	16
Inflam. subcellular,	10	3	1	...	...	1	...	5	..	50·	55·5	...	20	10
Lepra,	1	...	...	...	1	...	...	...	...	. .	...	...	...	58
Onychia,	4	1	2	...	1	...	...	..	...	...	...	...	28	17
Pityriasis,	1	...	1	...	...	...	...	...	...	...	...	...	...	16
Porrigo,	7	2	...	2	1	2	...	...	...	...	...	...	36	26
Psoriasis,	10	1	6	1	1	1	..	.	...	...	...	...	45	43
Rupia,	8	2	4	1	...	1	...	...	...	...	...	. .	39	24

Diseases.	Case	Cured.		Re-liev.		Dismis. fm. oth. causes.		Died.		Mortality per cent.			Aver. resi-dence.	
	Tot.	M.	F.	M	F.	M.	F.	M	F.	Tot.	M·	F.	M.	F.
Scabies,	3	1	2	..	...	...	. .	...	...	...	...	...	35	29
Sibbens,	3	...	2	...	1	...	...	...	...	...	...	...	...	36
Sinus,	4	...	...	3	...	1	...	...	...	...	...	...	11	...
Sycosis menti,	3	1	...	1	...	1	..	...	...	...	...	...	15	...
Total,	148	42	47	14	13	14	...	13	5	12·1	15·6	7·6	...	...
VIII. Osseous System.														
Fractures, 1st, simple.														
——— of bon. of up. ex.	43	22	15	1	...	2	3	...	...	...	..	...	25	28
——— of lower ex.	109	79	23	...	1	2	3	1	...	·9	1·2	...	49	42
——— of lower jaw,	2	2	...	..	...	...	..	...	...	..	..	...	12	...
——— of pelvis,	3	1	...	...	...	..	...	2	...	66·6	66·6	...	22	...
——— of ribs,	2	1	...	...	...	...	...	1	...	50·	50·	...	10	...
2d, Compound.														
——— of bon. of up. ex.	12	9	...	...	...	...	...	2	1	25·	18·1	100·	43	42
——— of lower ex.	30	16	2	.	...	1	...	10	1	36·6	37·	33·3	47	65
——— of lower jaw,	2	2	...	...	...	...	...	..	...	...	...	...	27	..
3d, Comminuted.														
——— of upper ex.	2	2	...	...	...	...	...	...	...	...	...	...	57	...
——— of lower ex.	3	1	...	...	...	...	...	2	...	66·6	66·6	...	18	..
Ankylosis of should. jnt.	1	..	...	...	...	1	...	...	...	...	...	...	2	...
Caries and necrosis,														
——— of thumb,	1	1	..	...	...	...	...	...	...	...	...	...	40	...
——— of ankle,	1	...	...	...	...	..	...	...	1	100·	...	100·	...	18
——— of tibia,	5	...	...	2	...	...	2	1	...	20·	33·3	...	23	58
——— of foot,	12	2	1	...	1	7	...	1	...	8·3	10·	...	27	45
——— of upper jaw,	1	..	...	1	..	...	...	...	..	...	...	...	3	...
——— of sternum,	1	...	...	...	...	...	1	...	...	...	...	...	3	...
Disease of upper jaw,	1	...	...	...	...	1	...	...	...	...	...	...	2	...
Periostitis of femur,	1	...	...	...	...	...	1	..	...	...	...	...	...	16
——— of tibia,	3	2	1	...	...	...	...	...	...	...	...	..	14	24
——— of foot,	1	...	1	...	...	...	...	...	...	...	...	...	...	11
——— syphilitic,	1	...	...	1	..	...	...	...	...	..	...	...	26	...
Skull, depression of	1	...	...	...	...	1	..	...	...	..	...	...	20	...
——— exfoliation of,	1	1	...	...	...	...	...	...	...	...	...	...	95	...
——— fracture of,	9	2	...	1	...	2	...	3	1	44·4	37·5	100·	18	1
Spine, disease of,	3	...	...	...	...	3	...	...	...	...	...	...	19	...
——— curvature of,	4	. .	...	1	2	...	1	...	...	...	...	...	56	48
——— injury of,	3	...	...	1	...	...	...	2	..	66·6	66·6	...	40	...
——— fracture of	2	...	...	...	...	...	...	2	...	100·	100·	...	35	...
Total,	260	143	43	8	4	20	11	27	4	11·9	13·6	6·4	...	...
IX. Art. and Fib. Sys.														
Ankle, disease of	10	2	3	3	...	2	..	...	...	...	...	...	20	19
Knee, do.	48	7	15	6	5	6	4	3	2	10·4	13·6	7·6	34	24
Hip, do.	20	2	2	8	2	3	2	1	...	5·	7·1	...	32	37
Wrist, do.	4	...	..	...	1	2	1	...	..	...	...	...	...	20
Tarsus, do.	3	2	...	...	1	...	...	...	...	...	...	...	37	66
Elbow, do.	7	2	...	3	...	...	...	2	...	28·5	28·5	...	42	...
Shoulder, do.	2	...	..	...	...	2	...	...	...	...	...	...	7	...
Lumbago,	2	1	...	1	...	...	...	...	...	...	...	...	38	...
Luxation of ankle,	4	...	...	...	1	...	...	3	...	75·	100·	...	13	6
——— of patella,	1	...	1	. .	...	..	...	...	...	..	...	...	...	27
——— of femur,	6	6	..	...	...	...	...	...	...	...	..	...	17	...
——— of clavicle,	3	3	..	...	...	...	...	...	...	...	...	...	15	...
——— sacro-iliac symph.	2	2	...	...	...	...	...	...	...	...	...	...	26	...

Diseases.	Case.	Cur.		Re-liev.		Dismis. fm. oth. causes.		Died.		Mortality per cent.			Aver. resi-dence	
	Tot.	M	F.	M	F.	M.	F.	M	F.	Tot.	M.	F.	M	F.
Luxation of shoulder,	1	1	...	...	...	...	...	..	...	...	...	...	2	...
———— elbow,	1	.	...	...	...	1	...	...	...	...	..	...	13	..
———— thumb,	1	1	...	...	...	...	...	...	...	...	...	...	6	...
———— wrist,	2	1	...	...	...	..	...	...	1	50.	...	100.	21	23
Rheumatism, .	76	32	20	6	8	4	4	1	1	2.6	2.3	3.	32	29
Sprained ankle, .	5	4	...	1	...	...	...	...	...	..	...	...	16	15
Talipes equinus,	1	...	..	...	...	1	...	...	...	...	..	..	2	...
——— varus,	1	...	...	...	...	...	1	...	...	..	...	...	...	38
Total, .	200	66	41	28	18	21	12	10	4	7.	8.	5.3	...	...
X. Chylopoietic System.														
Ascites, .	19	6	2	3	2	2	...	2	2	21.	15.3	38.3	33	28
Colic, . .	1	..	1	...	..	..	...	...	...	...	...	...	...	2
Colica pictonum,	2	1	...	1	...	...	...	...	...	...	...	...	18	...
Constipation, .	1	...	1	...	...	...	...	...	...	...	...	...	...	4
Diarrhœa, .	43	13	9	2	3	1	2	6	7	30.2	27.2	33.3	39	32
Dropsy, general,	39	10	4	2	3	...	1	13	6	48.7	52.	42.8	21	24
Dysentery, .	21	8	6	3	...	...	...	3	1	19.	21.4	14.2	30	26
Dyspepsia, .	19	4	6	4	2	2	1	...	...	...	..	...	38	21
Fistula in ano, .	23	19	...	2	...	2	..	.	..	...	...	...	20	...
Gastritis, .	1	..	...	1	...	...	...	...	...	...	...	...	15	...
Gastrodynia, .	2	1	...	1	...	...	...	...	.	...	...	..	29	...
Hæmatemesis, .	3	...	1	...	1	...	1	...	...	...	...	...	...	26
Hernia, femoral,	3	...	2	...	...	...	...	1	...	33.3	100.	...	4	6
——— inguinal,	7	3	1	..	...	1	1	1	...	14.2	20.	...	16	27
——— umbilical,	1	...	..	...	...	...	1	...	...	...	...	...	...	...
Imperforate anus,	1	...	...	...	...	...	...	1	...	100.	100.	...	3	...
Intus-susception,	2	...	...	...	...	...	...	2	..	100.	100.	...	8	...
Peritonitis, .	8	...	1	...	...	...	1	2	4	75.	100.	66.6	10	5
———— puerperal,	3	...	2	...	...	...	...	..	1	33.3	...	33.3	...	10
Poisoning, corrosive,	3	...	2	...	...	.	...	1	...	33.3	100.	...	12	22
Prolapsus ani, .	1	...	...	..	1	...	...	...	...	...	...	...	...	43
Rectum, disease of,	2	1	...	...	...	1	...	...	...	...	...	...	16	...
Stricture of œsophagus,	2	...	...	...	..	2	.	..	...	...	...	...	7	...
Total, .	207	66	36	19	12	11	8	32	21	25.6	25.	26.5	...	...
XI. Of the eye, ear, nose, mouth, throat, &c.														
Bite of nose, .	1	...	...	1	..	...	...	...	...	...	..	...	2	...
Cancer of eye-brow,	1	...	...	..	...	1	...	...	...	...	..	...	4	...
———— lip, .	4	1	1	1	...	...	...	1	...	25.	33.3	...	23	22
Cancrum oris, .	2	...	1	..	..	1	...	..	...	...	..	...	37	28
Conjunctivitis, .	2	1	...	...	1	...	...	...	...	...	..	.	7	13
Cut-throat, .	4	2	...	...	...	...	...	1	1	50.	33.3	100.	27	21
Enlarged tonsils,	1	...	...	...	...	1	..	...	...	...	..	...	4	...
Epistaxis, .	1	1	...	...	.	...	...	...	...	...	..	..	9	.
Disease of mouth,	1	...	...	.	...	...	1	..	..	...	..	...	...	14
———— nose & palate,	3	1	1	...	...	1	...	...	...	...	.	...	17	23
———— tongue,	1	1	..	...	...	...	...	...	...	...	..	...	29	...
Injury of eye, .	2	1	...	1	...	...	...	.	..	...	..	...	13	..
Iritis, . .	1	..	1	...	...	...	..	...	...	...	..	...	...	22
Lupus, . .	7	...	4	2	1	...	...	...	..	...	..	..	30	55
Œdema glottidis,	1	1	...	...	...	...	...	...	...	...	...	..	25	...
Ophthalmia, .	4	1	...	3	...	...	...	...	...	...	...	..	22	...
Sloughing of cornea,	1	...	...	1	..	...	...	...	...	...	...	...	27	...
Total, .	37	10	8	9	2	4	1	2	1	8.1	8.	8.3	..	...

Diseases.	Case.	Cured.		Relieved.		Dismis. fm. oth. causes.		Died.		Mortality per cent.			Aver. residence	
	Tot.	M.	F.	M.	F.	M.	F.	M.	F.	Tot.	M.	F.	M	F.
XII. Miscellaneous.														
Bruises and injuries,	132	100	13	4	3	4	...	7	1	6.	6.	5.8	19	24
Burns and scalds,	82	39	19	2	...	4	...	8	10	21.9	15.	34.4	23	24
Debility and starvation,	13	5	3	...	...	...	1	2	2	30.7	28.5	33.3	15	23
Dog bite.	1	1	...	...	...	...	...	...	...	...	...	...	4	...
Fungus hæmatodes,	2	...	...	...	...	2	...	...	...	...	...	...	81	...
Gangrene,	15	3	2	...	...	...	3	4	3	46.6	57.1	37.5	18	33
Moribund,	12	...	...	...	...	...	...	8	4	100.	100.	100.	1	1
Purulent infiltration,	1	...	...	...	...	...	...	1	...	100.	100.	...	30	...
Sequelæ of erysipelas,	6	2	3	1	...	..	...	..	...	...	...	..	22	11
———— fever,	7	...	4	...	...	..	..	2	1	42.8	100.	20.	37	27
———— pleuritis,	2	1	...	...	...	1	...	...	...	...	..	...	20	...
———— rubeola,	1	...	...	...	...	...	...	1	...	100.	100.	...	7	...
———— variola,	1	1	...	...	...	...	...	...	...	...	...	...	7	...
Tumours, abdominal,	5	...	1	...	1	1	1	1	...	20.	50.	..	5	44
———— condylomat.	2	..	1	...	...	...	1	...	...	...	...	..	...	17
———— maliguant,	4	1	1	...	..	1	1	...	...	...	...	..	23	31
———— miscellaneous characters,	18	2	5	4	...	3	2	1	1	11.1	10.	12.5	20	25
Wounds, lacerated, gun-shot, and incised,	42	30	6	1	1	3	...	1	...	2.4	2.9	...	30	35
———— of scalp,	29	14	8	1	..	2	...	3	1	13.7	15.	11.1	16	15
Ulcers,	110	28	40	23	7	7	5	...	...	...	...	..	21	32
Total,	484	227	106	36	12	28	14	39	23	12.8	11.8	14.8		
General total,	2383	883	445	252	152	198	111	226	114	14.3	14.6	13.8		

TABLE III. shows the causes, numbers, and mortality of the cases received as accidents during 1847.

Causes of the accidents.	Total cases.	Dismissed.			Died.		
		M.	F.	Tot.	M.	F.	Tot.
Assaults, ...	11	7	2	9	2	..	2
Burns and scalds, ...	82	45	19	64	8	10	18
Bites, ...	2	2	...	2	...	...	...
Coal-pit accidents, ...	47	39	...	39	8	...	8
Crushes between stones, vehicles, walls, &c.	17	16	1	17	...	...	...
Cut-throat, ...	4	2	...	2	1	1	2
Falls on ground, ...	42	20	13	33	8	1	9
Falls from a height, ...	84	63	10	73	9	2	11
Falls down stairs, ...	39	17	20	37	...	2	2
Gun-shot accidents, ...	3	3	...	3	...	...	...
Injuries from various instruments,	6	3	2	5	...	1	1
Kicks from horses, ...	3	1	1	2	1	...	1
Machinery accidents, ...	50	37	5	42	8	...	8
Railway accidents, ...	16	9	...	9	7	..	7
Run over by carts and other vehicles,	22	18	1	19	2	1	3
Weights or heavy articles falling on patients,	83	71	3	74	9	...	9
Cause of accidents not ascertained, ...	3	2	.	2	1	...	1
Total cases, ...	514	355	77	432	64	18	82

Table IV. exhibits the cases of bronchitis, with the mortality, &c., arranged according to the ages of the patients.

Bronchitis, 1847.	Total cases.	Dis-missed.		Died.		Mortality per cent.			Average residence.			Av. residence of fatal cases.		
Ages.	M.& F.	M.	F.	M.	F.	Tot.	M.	F.	Tot.	M	F.	Tot.	M	F.
1 to 10	..	...	..	...	...	...	...	...	...	...	...	...	..	..
10 to 15	4	2	1	1	...	25.	33.3	...	20	25	11	20	20	...
15 to 20	6	3	3	..	...	...	. .	...	20	20	21	...	...	..
20 to 30	31	14	9	5	3	25.8	26.3	25.	25	23	28	8	6	12
30 to 40	25	11	10	2	2	16.	15.4	16.6	23	24	22	12	11	14
40 to 50	12	5	6	1	..	8.3	16.6	...	20	24	17	23	23	...
50 to 50	11	5	4	1	1	18.2	16.6	20.	17	12	23	31	25	38
60 upwards	12	6	4	2	...	16.6	25.	...	21	20	24	26	26	...
Total,	101	46	37	12	6	17.8	20.7	14.	22	22	23	15	14	17

Table V. exhibits the cases of pneumonia, with the mortality, &c., arranged according to the ages of the patients.

Pneumonia, 1847.	Total Cases.	Dis-missed.		Died.		Mortality per cent.			Average residence.			Av. residence of fatal cases.		
Ages.	M.& F.	M	F.	M.	F.	Tot.	M.	F.	Tot.	M.	F.	Tot.	M	F.
1 to 10	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10 to 20	5	2	1	2	...	40	50	...	23	19	30	14	14	...
20 to 30	8	5	1	2	...	25	28.5	...	26	27	24	6	6	...
30 to 40	10	5	1	3	1	40	37.5	50	25	28	20	8	10	2
40 to 50	5	4	..	1	...	20	20	...	34	34	...	8	8	...
50 to 60	1	...	..	1	...	100	100	...	...	...	...	7	7	...
60 & upwds.	2	1	1	...	...	...	...	...	19	12	26	...	...	..
Total.	31	17	4	9	1	32.2	34.6	20	26	26	25	8	9	2

Table VI. exhibits the cases of phthisis, with the mortality, &c., arranged according to the ages of the patients.

Phthisis, 1847.	Total Cases.	Dis-missed.		Died.		Mortality per cent.			Average residence.			Av. residence of fatal cases.		
Ages.	M.& F.	M.	F.	M.	F.	Tot.	M.	F.	Tot.	M.	F.	Tot.	M	F.
1 to 10	4	2	1	...	1	25.	...	50.	43	16	99	40	...	40
10 to 20	15	10	2	2	1	20.	16.6	33.3	24	24	24	9	6	14
20 to 30	26	13	6	5	2	26.9	27.7	25.	21	18	28	20	18	28
30 to 40	20	9	5	4	2	30.	30.9	28.5	23	20	30	18	23	6
40 to 50	12	7	2	2	1	25.	22.2	33.3	27	23	42	14	13	17
50 to 60	2	2	...	...	...	...	...	...	30	30	...	...	..	...
60 & upwds.	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total.	79	43	16	13	7	25.3	23.2	30.4	26	23	34	18	17	19

TABLE VII. exhibits the cases of rheumatism, with the mortality, &c., arranged according to the ages of the patients.

Rheumatism, 1847.	Total Cases.	Dismissed.		Died.		Mortality per cent.			Average residence.			Av. residence of fatal cases.		
Ages.	M.& F.	M.	F.	M.	F.	Tot.	M.	F.	Tot.	M.	F.	Tot.	M	F.
1 to 14	1	..	1	...	...	...	...	...	7	...	7	...	...	...
14 to 20	3	2	1	...	...	...	...	..	21	18	26	...	...	...
20 to 30	30	14	15	1	...	3.33	6.66	...	29	30	29	9	9	...
30 to 40	19	11	7	...	1	5.26	...	12.5	32	31	34	11	...	11
40 to 50	12	8	4	...	...	...	...	...	32	36	23	...	...	...
50 to 60	11	7	4	...	...	...	...	...	40	44	31	...	..	...
60 & upwds.	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total,	76	42	32	1	1	2.6	2.3	3.	31	33	29	10	9	11

TABLE VIII. exhibiting the cases of scorbutus, with the mortality, &c., arranged according to the ages of the patients.

Scorbutus, 1847.	Total Cases.	Dismissed.		Died.		Average residence.		
Ages.	M. & F.	M.	F.	M.	F.	Total.	M.	F.
1 to 14	...	...	...	..	...	..	...	..
14 to 20	5	5	...	...	...	26	26	...
20 to 30	37	25	12	...	...	26	26	27
30 to 40	25	21	4	...	...	27	27	33
40 to 50	22	19	3	...	...	30	29	35
50 to 60	9	9	...	..	...	30	36	...
60 & upwards.	4	3	...	1	...	26	26	...
Total.	102	82	19	1	...	27	27	29

TABLE IX. exhibits a view of the numbers of males and females afflicted with the following diseases, arranged according to their admissions during each month.

1847.	Totals for each month.	Bronchit.		Pneumon.		Phthisis.		Rheumat.		Scorbutus.	
	M. and F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
January, ...	49	17	6	3	...	8	3	5	6	1	...
February, ...	32	7	8	1	...	5	4	3	4	...	..
March, ...	36	6	6	2	1	5	4	..	3	8	1
April,..... ...	36	3	4	1	...	5	1	..	3	14	5
May, ...	57	2	1	...	...	7	...	4	1	33	9
June, ...	33	1	1	..	...	3	2	3	2	18	3
July, ...	33	3	2	2	...	5	2	6	4	8	1
August, ...	20	4	3	2	1	4	1	4	1	...	...
September, ..	18	...	1	3	1	2	1	8	2	...	...
October, .. .	18	2	3	4	...	3	1	1	4	...	...
November,.. .	24	5	4	1	1	4	2	6	1	...	...
December,...	33	8	4	7	1	5	2	3	2	1	...
Total,...	389	58	43	26	5	56	23	43	33	83	19

TABLE X.—List of Operations performed during the year 1847, specifying their nature, causes, &c.

Operation.	Total.	Disease or Injury requiring Operation.	Cause of Death.	Cured.		Relieved.		Died.	
				M.	F.	M.	F.	M.	F.
Amput. Prim. at Shoulder Joint,	2	Avulsion—Extensive Laceration,		2					
... ... of Arm,	2	Bruise—Comp. Fracture,		2					
.. .. of Fore-arm,	6	4 Laceration—Bruise—Comp. Fracture,	Injury of Head—Meningitis,	4	...	...	1	1	
... ... of Hand,	1	Bruise,		1					
... ... of part of Hand,	3	Crush,		3					
... ... of Fingers,	7	3 Bruise—4 Laceration,		7					
.. ... of Thigh,	3	2 Comp. Fract.—1 Laceration of Knee-joint,	Phlebitis,	...	..	...	...	3	
... .. of both Legs,	1	Comminuted Injury,	Shock,	...	...	...	...	1	
... ... of Leg,	5	2 Com. Disloc. of Ankle-joint—3. Com. Fract.	Cel. Infla. Gang. Shock,	2	...	...	...	3	
... ... Chopart's operation,	1	Bruise and Laceration,		1					
... ... of Great Toe,	1	Comp. Fract. and Laceration,		1					
... Second at Shoulder Joint,	1	Gangrene,	Shock,	...	...	...	...	1	
... ... of Arm,	5	4 Struma of Elbow-joint—1 Comp. Fracture,	2 Phlebitis—Shock,	2	...	...	...	2	1
... ... of Fore-arm,	1	Gunshot Wound,		1					
... ... of Fingers,	4	2 Struma—Whitlow—Deform. from Burn,		4					
.. ... of Hand,	1	Malignant Disease Affect. Cicat. of Burn,		1					
... ... of Thigh,	11	3 Struma—3 Comp. Fract.—1 Ulcer of Cart. of Knee-jo.—2 Necrosis of Tibia.—2 Lacera.	3 Phlebitis—Diarrhœa—Empyema—Shock,	4	1	...	...	5	1
... ... of both Legs,	1	Gangrene,		1					
... ... of Leg,	3	1 Comp. Fract.—2 Gangrene,	Phlebitis,	...	1	...	...	2	
.. ... of Leg, and Chop. oper. on other foot,	1	Gangrene,		...	1				
... ... Chopart's operation on both feet,	1		Phlebitis,	...	...	...	...	...	1
... ... Chopart's operation,	3	Strumous Disease,	Phlebitis,	2	...	..	...	1	
... ... Lisfranc's do.	1	Gangrene,		1					
... ... of Great Toe,	1	Exposure of last Phalanx,		1					
... ... of Toes,	1	Gangrene,		1					
Excision of Mamma,	7	6 Scirrhus—Simple Tumour,	Erysipelas—Phlebitis—Int. Scirrh.	...	4	...	...	...	3

Excision of Ankle Joint,	1	Compound Dislocation,	Abscess of Thigh,	...	...	...	...	1	
... of Inf. Maxilla,	1	Malignant Tumour,		1					
... of Lip,	4	Scirrhus,	Apoplexy,	1	2	...	...	1	
... of Lip, with Taliacotian op.	1			1					
... of Eyebrow,	1			1					
... of Cutaneous Cancer,	1			...	1				
Extirpation of Testicle,	1	Tubercular Degeneration,		1					
... of Malignant Tumours,	3			2	1				
... of Scrofulous do.	2		Phlebitis,	1	...	...	...	1	
... of Fungus of Scalp,	1			...	1				
... of Encysted Tumour,	1		Phlebitis,	...	...	...	...	...	1
... of Uterine Polypus,	1			...	1				
Sections Subcutaneous,	2	Varus—Contracted Hamstrings,		1	...	1			
... of Anal Fistulæ,	19			19					
... of inner layer of Prepuce,	1			1					
Reduction of Hernia by operation,	4	2 Strang. Fem.—2 Strang. Oblique Inguin.	Peritonitis—Enteritis,	1	1	...	...	2	
... of Hernia by Taxis,	2	1 Fem.—1 Oblique,		1	1				
... of Humerus,	18	Luxation—11 Backwards—7 forwards,		18					
... of Ulna,	1	Backwards at Elbow,		1					
... of Carpus,	1	Compound Dislocation Backwards,		1					
... of Femur,	6	Dislocation Upwards and Backwards,		6					
... of Patella,	1	Dislocation Outwards,		1	1				
... of Thumb,	1	Dislocation Backwards,		1					
Ligature of Femoral Artery,	1	Popliteal Aneurism,		1					
Lithotomy,	11	Calculus in Vesica	Gran. degen. of Kidney,	7	3	...	...	1	
Urethrotomy,	2	Calculus in Urethra—Ruptured Urethra,	Shock,	1	...	...	...	1	
Circumcision of Prepuce,	1	Syphilitic Affection,		1					
Puncture of Bladder per Rectum,	1	Injury of Urethra,	Infiltration,	...	...	...	...	1	
Laryngotomy,	2	Laryngeal Spasm—Œdema Glottidis,	Asphyxia,	1	...	...	...	1	
Forming Artificial Anus,	1	Imperforate Anus,		...	...	...	...	1	
Hydrocele, Operation for,	9	5 Tapped—4 Injected,		6	...	3			
Staphyloma, Operation for,	1			...	...	1			
Elevation of Depressed Skull,	1		Injury,	...	...	...	...	1	
Total,	178			116	19	5	1	30	7

The greater number of cases of Dislocation had no residence in the Hospital, and, consequently, they do not appear in the Disease Table.

The principal feature which strikes us on a review of the preceding tables, is the greater amount of mortality in the present as evinced by a comparison with the returns of former years. During the last three years, there has been a gradual increase in the number of deaths in proportion to the number of cases treated. In the series of statistics for 1846, Dr Orr endeavoured to explain this circumstance by a reference to the severer nature of the cases admitted for treatment. The same fact holds good with those treated during 1847; and it will likewise be borne in mind, that it was found necessary, during the year, to make a selection of the more urgent cases offering themselves, as the accommodation generally afforded in seasons of an unusual influx of such cases by the vacant wards of the Fever Hospital was entirely occupied by those afflicted with the epidemic. Another circumstance, which doubtless had a cogent influence in increasing the bill of mortality, might be traced to the extremely debilitated condition of a large proportion of the cases under treatment. The want of employment and the high price of provisions, to which the lower orders were subjected during the bygone year, had a corresponding effect in increasing their liability to disease. The baneful influence of an impoverished regimen in rendering its victims less amenable to medical treatment is generally acknowledged, and its results are fully corroborated by last year's experience.

That such irregularities were also the primary cause of producing disease is evident from the occurrence of an epidemic of scorbutus during the early part of the year, an interesting account of which appeared in the Monthly Medical Journal for July last, written by Dr Ritchie. As this disease is singular and interesting from its having appeared almost simultaneously in an endemic form in various parts of Scotland, I have prepared table viii., specifying the ages and results of the cases treated. The occupations in which these patients were engaged were the following:—Of the males, 27 were labourers on the various railways round Glasgow, 12 were weavers, 5 shoemakers, 5 quarriers, 4 factory employment, 3 sailors, while the remaining 25 pursued miscellaneous mechanical pursuits. Of the females, 16 were engaged in factories, and the remaining 6 followed sedentary occupations. The mortality in scorbutus, as will be seen by the table, was extremely limited;—only one fatal case having occurred, and this in an individual above 60 years of age. In this patient the disease was complicated with severe diarrhœa, and in all probability the latter affection was the proximate cause of death. It is proper to notice here that the cases of scorbutus which were complicated with fever are not included in table viii.

In the more formidable lists of diseases of the respiratory organs, that of *bronchitis* shows an increase of cases above that of previous years, and the mortality especially among the males has also been proportionally greater. The table exhibiting the returns of the patients treated for pneumonia, bears a resemblance in its details to the tables of former years, with this exception, that a larger number than usual were between the ages of 30 and 40.

The phthisical cases are fewer than those of 1846, and the mortality is proportionably less. Fully one-half of the number treated were between the ages of 20 and 40: the same fact is observable by a reference to the statistics for former years.

The season of the year which proved most favourable to the production of chest diseases, appears from table ix. to have been during spring,—the numbers gradually decreasing, as might have been expected, in the more genial months of summer and autumn, and increasing again as the winter approached. It will be observed that females have suffered less in proportion from these diseases during the year than males.

The operation list exhibits a very slight increase of cases from that of 1846, while the diseases and injuries requiring operation have been of a severer character, and the returns in consequence present a higher rate of mortality. Amputations of the lower extremities, both primary and secondary, have proved alarmingly fatal,—the former in a greater degree than the latter. Of 9 amputations of the leg and thigh performed during the primary stage, only 2 have recovered, while 8 of the 16 patients who underwent similar operations in the secondary stage have died. Lithotomy was performed during the year on 8 males and 3 females. In three of these cases the mesial operation, as lately modified by Dr A. Buchanan, was adopted by the same gentleman. The only fatal result occurred in the case of a shoemaker, aged 24, who had granular disease of the kidneys previously existing. The inhalation of ether, and latterly of chloroform, has been used successfully in all cases requiring severe operations, provided the strength of the patient was such as to sanction its use.

The number of individuals who, during the year, received medical advice at the dispensary connected with the institution, amounted to 4636; but from the flitting character of such cases, it is impossible to furnish satisfactory data as to the diseases and results of the treatment employed.

II.—STATISTICS OF THE FEVER DEPARTMENT.

The number of patients remaining in the Fever Hospital on the 1st of January 1847, was 232. The number admitted during the year was 5186; while there remained in these wards on the 1st January 1848, 194, leaving a total of 5224 cases which were treated to a termination. Of this number, 2771 were males and 2453 were females. Of the former, 508 or 1 in 5·4 died;

of the latter, 296, or 1 in 8·2, died. The average number in hospital as calculated for the whole year was 284.

TABLE XI. exhibits a numerical analysis of the movements in the fever department of the institution during 1847.

Fever, 1847.	Admitted.			Dismissed.			Died.			Aver. No. in hospit.			Mortality per cent.		
	Tot.	M.	F.	Tot.	M.	F.	T.	M.	F.	To	M.	F.	Tot.	M.	F.
Jan. …	330	160	170	277	134	143	40	19	21	259	104	155	12.1	11.9	12.3
Feb. …	378	201	172	272	137	135	45	27	18	276	129	147	12.	13.3	10.4
March,	423	214	209	365	186	179	60	38	22	298	142	156	14.2	17.7	10.5
April,	409	206	203	348	159	189	71	45	26	292	140	152	17.3	21.8	9.2
May, .	494	240	254	412	196	216	84	49	35	291	141	150	17.	20.4	13.7
June,.	639	340	299	420	208	212	97	56	41	310	152	158	15.6	16.5	13.7
July, .	596	338	258	560	291	269	106	78	28	369	195	174	17.7	23.	10.9
Augt.	422	232	190	418	216	202	60	46	14	278	146	132	14.2	20.	7.5
Sept …	412	232	180	377	200	177	52	35	17	236	124	112	12.6	15.1	9.4
Octob.	414	232	182	359	194	165	46	28	18	296	158	138	11.1	12.	9.9
Nov. …	398	214	184	339	189	150	72	44	28	285	160	125	18.1	25.8	15.2
Dec. …	276	170	106	273	153	120	71	43	28	223	117	106	25.7	25.3	26.4
Total,	5186	2779	2407	4420	2263	2157	804	508	296	284	142	142	15.5	18.2	12.3

TABLE XII. exhibits a view of the diseases treated to a termination in the fever wards during 1847, with the Nos. cured and dead.

Diseases.	Cas.	Cur.	Died	Diseases.	Cas.	Cur.	Died
Epidemic fever, ...	2333	2184	149	Gangrene, ...	1	...	1
Typhus fever, ...	2399	1889	510	——— of lung, ...	1	...	1
Dothinenteritis, ...	127	84	43	Headach, ...	1	1	...
Febricula, ...	57	57	...	Heart, disease of, ...	3	1	2
Influenza,.........	11	9	2	Hemiplegia, ...	1	1	...
Rubeola, ...	1	1	...	Herpes, ...	1	1	...
Scarlatina, ...	6	6	...	Icterus, ...	1	...	1
Varicella,...	1	1	...	Insanity, ...	1	1	...
Variola, ...	84	63	21	Intoxication, ...	2	2	...
Abscess in perinæo ...	1	1	...	Laryngitis, ...	1	...	1
Amenorrhœa, ...	1	1	...	Meningitis, ...	1	...	1
Bronchitis, ...	24	15	9	Moribund, ...	26	...	26
Burn of back,............	1	1	...	Parotitis,...	2	2	...
Catarrh, ...	3	3	...	Peritonitis, ...	2	...	2
Cynanche, ...	1	1	...	Pertussis, ...	1	...	1
Debility and senility,...	10	7	3	Phrenitis, ...	1	1	...
Delirium tremens, ...	3	1	2	Phthisis, ...	4	1	3
Destitution & starvation	35	30	5	Pleurisy, ...	6	6	...
Diarrhœa, ...	15	12	3	Pleuropneumonia, ...	3	2	1
Disease none, ...	8	8	...	Pneumonia,........... ...	19	12	7
——— unknown, ...	3	1	2	Purpura, ...	1	...	1
Dropsy and ascites, ...	2	1	1	Rheumatism, ...	1	1	...
Dysentery, ...	8	5	3	Scorbutus, ...	2	1	1
Emphysema pulmon...	1	1	...	Tabes mesenterica, ...	1	..	1
Endocarditis, ...	1	1	...	Vermes, ...	1	1	...
Erysipelas, ...	2	2	...				
Fever, sequelae of.	2	1	1	Total, .	5224	4420	804

TABLE XIII. exhibits a view of the two principal forms of fever treated during 1847, and arranged according to the monthly returns.

Fever. 1847.	Epidemic fever.					Typhus fever.					Mortality per cent.	
	Total.	Cured.		Died		Total.	Cured.		Died.		Epidem.	Typhus
	M.&F.	M.	F.	M	F.	M.& F.	M.	F.	M.	F.		
January, ...	192	69	104	7	12	66	32	24	6	4	9.9	15.
February,	181	88	82	4	7	93	28	42	17	6	6.	24.7
March, ...	265	131	115	8	11	88	20	40	20	8	7.2	31.8
April, ...	226	96	104	14	12	135	49	66	10	10	11.5	14.8
May, ...	226	104	110	6	6	218	75	95	25	23	5.3	22.
June, ...	222	100	109	6	7	226	80	82	36	28	5.9	28.3
July, ...	239	111	114	10	4	400	183	129	64	24	5.8	22.
August, ...	198	99	92	3	4	246	111	91	34	10	3.5	17.8
September,	182	90	87	4	1	235	108	86	27	14	2.7	17.4
October, ...	162	89	66	3	4	227	106	88	20	13	4.3	14.5
November,	133	65	62	5	1	262	117	86	39	20	4.5	22.5
December,	107	46	51	5	5	203	102	49	30	22	9.3	25.6
Total,	2333	1088	1096	75	74	2399	1011	878	328	182	6.3	21.2

TABLE XIV. exhibits the number of cases of Epidemic or Bilious relapsing Fever, arranged according to the ages of the patients, also the sexes and relative mortality.

Epidemic Fever. 1847.	Total Cases.	Cured.		Died.		Mortality per cent.			Average residence in days.		Av. resid. of cases that died.	
Ages.	M.&F.	M.	F.	M.	F.	Tot.	M.	F.	M.	F.	M.	F.
1 to 10	97	43	52	1	1	2.	2.3	1.9	22	18	13	10
10 to 15	205	91	108	3	3	2.9	3.2	2.7	20	21	19	21
15 to 20	481	226	237	8	10	3.7	3.4	4.	18	19	16	20
20 to 30	755	363	351	18	23	5.4	4.7	6.	18	18	15	10
30 to 40	417	199	192	12	14	6.2	5.7	6.8	20	22	18	13
40 to 50	225	101	98	19	7	11.5	16.	6.6	21	21	14	17
50 to 60	89	35	38	8	8	18.	18.6	17.4	23	24	12	7
60 upwards.	64	27	23	5	9	21.8	15.6	28.1	23	25	5	17
Total,	2333	1085	1099	74	75	6.38	6.38	6.31	20	20	14	13

TABLE XV. exhibits the number of cases of typhus fever, arranged according to the ages of the patients, distinguishing also the sexes and relative mortality.

Epidemic Fever. 1847.	Total Cases.	Cured.		Died.		Mortality per cent.			Average residence in days.		Av. residence of fatal cases.	
Ages.	M.&F.	M.	F.	M.	F.	Tot	M.	F.	M.	F.	M.	F.
1 to 10	68	34	31	2	1	4.4	5.5	3.1	17	21	11	20
10 to 15	195	97	88	4	6	5.1	3.9	6.3	22	21	6	8
15 to 20	422	193	173	31	25	13.3	13.4	12.6	23	24	10	15
20 to 30	942	494	272	111	65	18.6	18.3	19.2	18	20	9	9
30 to 40	416	165	123	85	43	30.8	34.	25.9	20	22	9	16
40 to 50	256	89	76	59	32	35.5	39.8	29.5	21	20	10	7
50 to 60	75	18	27	19	11	40.	51.3	28.9	18	12	5	4
60 upwards.	25	7	2	11	5	64.	61.1	71.4	20	18	4	6
Total,	2399	1097	792	322	188	21.2	22.6	19.1	19	21	9	10

Table XVI. presents a view of those affections with which the two principal forms of Fever were found most complicated, arranged according to the Monthly returns, and distinguishing the Sexes.

1847. Months.	Total for each Month.	Epidemic Fever complicated with								Typhus Fever complicated with								Total for each Month.
		Bronchitis.		Pneumonia.		Diarrhœa.		Erysipelas.		Bronchitis.		Pneumonia.		Diarrhœa.		Erysipelas.		
		M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
January,...	16	1	9	...	1	2	3	...	...	1	1	...	...	...	...	...	...	2
February,..	7	2	2	...	...	2	1	...	...	...	...	...	...	...	...	1	...	1
March,.....	16	2	3	2	2	2	2	3	...	...	...	...	...	...	...	...	...	...
April,......	10	1	2	...	...	1	1	2	3	...	2	...	...	...	...	2	1	5
May,........	10	2	3	1	1	...	...	2	1	1	5	...	1	...	...	1	...	8
June,......	15	3	4	2	...	2	1	2	1	6	10	...	4	...	...	4	1	25
July,........	14	4	5	1	...	2	...	2	...	9	7	1	2	3	1	3	1	27
August,....	8	...	2	1	1	1	2	1	...	3	2	1	1	1	2	2	1	13
September,	10	1	1	2	...	3	1	1	1	1	10	1	...	3	...	5	1	21
October,...	5	3	1	...	...	...	1	...	...	2	5	...	...	2	1	...	...	10
November,	11	2	2	1	1	1	...	2	2	2	7	3	...	5	...	11	1	29
December,	14	3	5	1	...	2	1	1	1	4	7	3	...	1	1	13	2	31
Total,	136	24	39	11	6	18	13	16	9	29	56	9	8	15	5	42	8	172

Table XVII. exhibits the Ages and Mortality of the cases of Epidemic Fever which were complicated with these diseases.

1847. Epidemic Fever with complic.	Total.	Bronchitis complic.				Pneumonia complic.				Diarrhœa complic.				Erysipelas complic.			
		Cured.		Died.		Cured.		Died.		Cured.		Died.		Cured.		Died.	
Ages.	M. & F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
1 to 10	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10 to 15	4	1	...	..	...	...	1	...	1	...	...	...	...	1	...	...	...
15 to 20	20	3	6	...	3	1	...	2	...	1	1	...	...	1	2	...	...
20 to 30	40	4	14	...	3	3	1	1	...	2	4	2	...	6	...	...	...
30 to 40	26	5	3	...	1	...	...	1	2	6	2	...	2	1	1	2	...
40 to 50	31	4	6	2	...	2	...	1	...	2	...	2	2	4	4	...	2
50 to 60	10	2	2	1	...	...	...	...	...	2	1	1	...	...	...	1	...
60 upwards.	5	1	1	1	...	...	...	...	1	...	...	...	1	...	...	...	...

TABLE XVIII. exhibits the ages, mortality, &c. of the cases of typhus fever which were complicated with these diseases.

1847. Typh. with comp.	Total.	With Bronchitis.				With Pneumonia.				With Diarrhœa.				With Erysipelas.			
		Cured		Died.		Cured		Died.		Cured		Died.		Cured		Died.	
Ages.	M.&F.	M	F.	M	F.	M	F.	M	F.	M	F.	M	F.	M	F.	M	F.
1 to 10	...	...	...	...	...	...	...	...	...	...	..	..	..	...	...	...	...
10 to 15	9	1	2	1	..	1	...	1	...	...	...	..	...	2	1	..	...
15 to 20	29	3	9	...	...	1	1	3	1	4	...	...	...	5	1	1	..
20 to 30	67	13	26	3	1	...	...	2	2	4	3	...	..	17	3	3	...
30 to 40	34	3	6	...	7	1	...	...	2	1	1	1	...	7	3	2	...
40 to 50	18	3	5	1	2	..	...	...	2	..	...	2	...	3	...	...	...
50 to 60	11	1	2	..	3	...	.	...	...	1	1	1	..	2	...	...	...
60 & upwds.	4	...	1	...	2	..	...	..	...	1	...	...	...	...	...	...	...
Total,	172	24	41	5	15	3	1	6	7	11	5	4	...	36	8	6	...

TABLE XIX. exhibits the cases of dothinenteritis treated in the whole institution, with the ages, mortality, &c. of the patients.

Dothinenteritis. 1847.	Total.	Cured.		Died.		Mortality per cent.			Average residence.			Average residence of fatal cases.		
Ages.	M. & F.	M.	F.	M.	F.	Tot.	M.	F.	Total.	M.	F.	Total.	M	F.
1 to 10	1	...	1	...	..	...	...	...	72	...	72	...	...	..
10 to 15	11	2	5	...	4	36.3	...	44.4	23	28	21	19	...	19
15 to 20	31	6	13	6	7	38.7	45.4	35.	29	24	31	15	23	10
20 to 30	84	41	19	20	4	29.6	32.8	17.4	29	28	32	17	17	15
30 to 40	12	5	3	4	.	33.3	44.4	...	27	32	19	14	14	...
40 to 50	4	1	1	2	...	50.	66.6	. .	32	23	42	11	11	...
50 to 60	2	..	2	...	..	...	...	...	26	...	26	...	...	...
60 upwards.	...	...	...	..	...	...	...	...	...	...	...	...	...	...
Total,	145	55	44	31	15	31.7	36.	25.4	29	28	30	16	17	14

TABLE XX. shows the other diseases with which bilious relapsing fever was complicated, distinguishing the sexes and numbers cured and dead.

Bilious Relapsing Fever complicated with	Total.	Cured.		Died.		Mortality per cent.		
	M.& F.	M.	F.	M.	F.	M.& F.	M.	F.
Diseases of the nervous system,	4	...	...	3	1	100.	100.	100.
——— circulatory system,	21	7	12	1	1	9.52	12.5	7.7
Other complic. with respir. organs,	17	4	9	3	1	23.53	42.85	10.
Diseases of genito-urinary organs,	9	...	6	1	2	33.33	100.	25.
——— gland. system, ict. & hepat.	7	3	3	1	...	14.28	25.	...
——— of integumentary system,	9	2	6	1	...	11.11	33.33	...
Rheumatic complications, .	5	2	1	1	1	40.	33.33	50.
Complications with peritonitis, .	2	.	..	1	1	100.	100.	100.
Diseases of mouth and throat, .	3	. .	3	...	...	...	...	..
Total, .	77	18	40	12	7	24.67	40.	14.89

Table XXI. shows the other diseases with which typhus fever was complicated, distinguishing the sexes and relative mortality.

Typhus Fever complicated with	Total.	Cur.		Died.		Mortality per cent.		
	M.&F.	M	F.	M.	F.	Total.	M.	F.
Diseases of nervous system, .	12	...	3	5	4	75.	100.	57.14
———— circulatory system,	5	1	1	...	3	60.	...	75.
Complications with pleuritis, .	13	3	2	5	3	61 59	62.5	60.
Other complic. with resp. organs,	8	3	1	1	3	50.	25.	75.
Diseases of genito-urinary organs,	7	2	3	1	1	28.57	33.33	25.
———— glandular system, .	3	2	1	...	...	...	...	...
———— integumentary system,	21	9	10	1	1	9.54	10.	9.09
Complicated with rheumatism,	2	...	1	1	...	50.	100.	80.
———— peritonitis, .	8	1	1	2	4	75.	66.66	80.
Diseases of mouth and throat,	10	4	3	2	1	30.	33.33	25.
Total, .	89	25	26	18	20	42.47	41.86	43.48

Table XXII. gives a list of the cases treated in the temporary fever shed, from its opening on the 24th June 1847, till its closing on the 24th February 1848, specifying the diseases, result of treatment, &c.

Diseases.	Total.	Cured.		Died.	
1847.	M.&F.	M.	F.	M.	F.
Typhus fever, uncomplicated, .	359	137	127	53	42
———— and pneumonia, .	10	4	1	4	1
———— bronchitis, .	26	17	5	3	1
———— pleuritis, . .	12	6	2	3	1
———— pleuro-pneumonia,	7	3	1	2	1
———— erysipelas, .	6	3	2	1	...
———— diarrhœa, .	23	18	3	...	2
———— retention of urine,	10	6	3	...	1
———— bed sores, .	1	...	1	...	...
Bilious relapsing fever uncomplicated,	388	198	177	8	5
———— and bronchitis,	25	13	8	3	1
———— diarrhœa,	33	18	9	3	3
———— empyema,	1	...	...	1	...
———— phthisis,	1	...	1	...	...
———— pneumonia,	28	17	8	2	1
———— catarrh, .	4	2	2	...	...
———— variola, .	5	3	...	2	...
———— anasarca, .	7	1	6	...	...
———— scorbutus,	3	3	...	...	...
———— necr. of fem.	1	1	...	...	...
Variola, . . .	1	1	...	...	...
Slight pyrexia, . .	3	2	1	...	...
Total, . .	954	453	357	85	59

Glasgow, proverbial for the severity of its epidemic visitations, has suffered an appalling increase as regards both the extent and mortality of the disease in question, if the foregoing tables can be taken as an index of comparison; and although the statistics of any single hospital cannot at all times be relied on as furnishing accurate and comprehensive data as to the progress of fever in a large city, there are certain seasons—and the last may be included among such—where the hospital returns afford a satisfactory clue to the history of disease. Thus, a striking similarity existed during the year between the reports of the Fever Hospitals independent of the infirmary, and those of the infirmary itself; and this was not confined to the proportionate numbers of those attacked, but extended itself to the different phases which the epidemic exhibited at stated periods during its prevalence.

In the previous volume of this Journal, (lxix.) Dr Orr, late superintendent of the Royal Infirmary, has given an excellent paper on the progress of fever during the past year, and has anticipated me in many general statements which otherwise would have been made in this place. To that historical and statistical sketch I refer those interested in the subject.

The two principal forms of fever which prevailed throughout the year were the bilious relapsing and the common typhus peculiar to the country; the latter disease proving by far the most deadly. Another, and a still more formidable type of fever prevailed, though in a less degree than the others, and continued to show itself occasionally during the year in the form of an intercurrent epidemic. This was the typhoid or dothinenteric fever, the returns of which are specified in table xix.

The form of fever, distinguished by a multiplicity of names, such as bilious relapsing, gastro-hepatic, epidemic, or short fever, averaged nearly one-half of the cases treated in hospital. This epidemic, which first appeared in Edinburgh and Glasgow during 1843, again presented itself in 1846, and formed at that period a large proportion of the cases treated in the Glasgow Hospital. The symptoms characteristic of the disease differed in so many respects from those observable at its first appearance, that it may almost be said to have undergone a transition state. From tables which the writer kept while acting as clerk to Dr Craigie in the Edinburgh Infirmary, at the outbreak and subsequent prevalence of the epidemic, the average mortality was found never to range above three or four per cent. of the cases treated. The only complication of any consequence was icterus, which attacked a large proportion of the sufferers, but was much less common in the Edinburgh than in the Glasgow epidemic of the same period.

Abortion was an invariable sequence in pregnant females who suffered from an attack at this time, otherwise the fever was of a much milder nature, inflammatory complications proving less frequent, and the accompanying relapse was both shorter and milder in its character. The interval between the first attack and the period of relapse was formerly much better marked; the patients often evincing a wish during the period to resume their usual employments, the temporary restoration to health proving so complete. The greater tendency to inflammatory complications in the respiratory organs, and the lengthened and more severe form of the relapse are the two distinguishing features of the present epidemic. The interval succeeding the first attack is, however, far from being regular or well marked, and, in some instances, no relapse whatever is observable. In such cases, the primary attack is protracted for an indefinite period. An important character observable from the records was the immunity which individuals enjoyed from this disease, who had suffered previously from an attack of typhus fever. Cases of typhus, following in the track of bilious relapsing fever, were by no means uncommon, while there is not one instance recorded of the former epidemic being followed by the latter.

It will be seen by reference to table xiii. that the two diseases kept steadily advancing somewhat in an inverse ratio. At the beginning of the year, the cases of relapsing fever averaged about three-fourths of the whole admissions. The disease advanced, though very gradually, till the month of July, after which the number began to decline, and, at present, April 1848, they form but a small proportion of the cases under treatment. The number of typhus patients admitted in January 1847 was so low as 66. The admissions increased rapidly till July, when they outnumbered those of the rival epidemic. After this period typhus cases began to decline very slowly, at the same time always keeping a-head of the relapsing cases, so that, at the close of the year, the former averaged about two-thirds of the whole fever cases then under treatment. The month of July is thus shown to have been the period when the epidemic reached its maximum, and consequently its culminating point, after which began the period of declination, extending down to the present time. From the greatly diminished number of admissions into the Infirmary Fever Hospital, as well as into the parochial fever hospitals, we have good ground for supposing that the present periodical visitation has well nigh run its course.

A novel, and perhaps the most interesting feature in the statistics of the fever department is exhibited by table xix., specifying the cases of *dothinenteritis*, which occurred in the experience of last year. During the latter months of 1846, several cases of this affection manifested themselves in the fever wards; but from the comparative novelty of the disease, as well as the difficulty sometimes experienced in diagnosing it from the forms of continued fever then existing, such cases were classed under the head of common continued fever. The above table presents the returns of 145 well-marked cases of the disease. The ages of the individuals most prone to attacks were between 20 and 30 ; the same holds good with the other forms of fever, as will be seen by reference to their respective tables. The average mortality in the dothinenteric cases was about one in three of those attacked ; males suffering more in this respect than females. The males affected were chiefly Irish labourers, resident in the most unhealthy districts of the city, from which fever is seldom absent. The disease itself, as appears from the records, was almost entirely confined to the patients received from the town, there being only sixteen cases reported as having come direct from the country. These returns show a marked similarity to the accounts received from other countries where this disease forms the staple epidemic. The morbid appearances presented by the fatal cases were likewise precisely similar to the descriptions given by French and American authors who have written on the disease. These consisted chiefly of extensive lesions and ulcerations of the elliptical plates of the ileum, involving the solitary and aggregate glands, and occasionally ending in perforation of the intestine ; this latter appearance presenting itself in cases which were apparently not the most severe. It is to be regretted that we cannot furnish the morbid appearances as they occurred in the fatal cases in a tabular form.

Considerable misapprehension may naturally exist concerning the classification adopted in the fever tables, from the circumstance of there being no cases classed under the head of common continued fever, which has so long formed a large proportion of the admissions into hospital. It is difficult to account for this apparent discrepancy, except by supposing that the common continued fever has in a manner resolved itself into the typhoid or dothinenteric form; and those cases which still retain some symptoms of the former disease are now invariably classed under the head of the latter, to which they appear to be nearest akin.

Table xxii. presents the returns of the cases treated in the fever shed, specifying likewise the various complications which existed. Necessity demanded the erection of such temporary accommodation, both in this city and in Edinburgh, as the only alternative which the authorities had in the trying exigencies of the period. The measures thus employed are commonly decried as being ill calculated to meet the emergency, not only from the expense attending their erection, but from their being otherwise ill adapted for the reception of fever patients. Certainly, all things considered, we cannot argue much for the claims of such establishments; but one alleviating circumstance, as demonstrated by the returns of the Glasgow Hospital, is too important to pass unnoticed. I allude to the paucity which the records of the temporary shed exhibit as to the cases of fever which were complicated with erysipelas. Towards the end of last year and the beginning of the present, erysipelatous complications became so frequent, that a large proportion, nearly one-sixth of the whole cases in the fever hospital, underwent an attack. The complication extended to every part of the building, attacking males and females indiscriminately, and proving more or less severe in different cases. The erysipelas was distinguished by its erratic character, generally presenting itself over the region of the larynx, extending upwards over the face, often involving the scalp, and occasionally proceeding to other parts of the body. Notwithstanding the prevalence of the complication in the regular fever hospital, it is matter of agreeable surprise that only six cases should have manifested themselves in the temporary fever shed. The relative mortality was not greater in the temporary accommodation, although, from its less habitable character, we would have expected more serious results. For a considerable portion of the winter months the temperature ranged between 25° and 35° F., and allowing all the means adopted to render the apartments in a fit condition for receiving invalids, the temperature rarely exceeded 40° F., while that of the fever hospital was retained at a regular equilibrium of 60° F.

It is worthy of notice in this place, though perhaps to the prejudice of our fever hospital, that the mortality returns of the fever cases treated throughout the city, both in the parochial hospitals and by the district surgeons, averaged much less in proportion than those of the infirmary, and it scarcely admits of question, that the accommodation afforded by the regular hospital is infinitely superior to that outside. These facts tend to favour the supposition that the miasmata engendered by long concentration in the wards of an hospital, have a decidedly prejudicial effect on the disease itself, and inculcate the necessity of employing from time to time those sanatory means best fitted for the destruction of the morbific influence.

Periods of unusual public distress, occasioned by depression of trade and the partial deprivation of the necessaries of life, as was experienced in the past year, uniformly combine to produce and foster fever among the population. This displays itself most in large cities, not only from the greater amount of destitution and want of cleanliness which so frequently prevail among the pauper inhabitants, but also from the large numbers who, through dire necessity, are forced to leave their native homes, to hazard a miserable existence in the crowded and ill-ventilated districts of a manufacturing town. The susceptibility of these recent residenters to the contagious influence of fever is one of the most characteristic features of the disease, and proves, to the sad experience of its victims, that they have only evaded the Scylla of their former abodes, to be immersed into the Charybdis of their present. The amount of pauper immigration into Glasgow from the western Highlands, but more especially from Ireland, has during the last year increased to a great extent, and the records of the fever hospitals exhibit, as might have been expected, a greater liability among such immigrants to attacks of the disease. For the last few years the numbers of Irish admitted to the Infirmary have been gradually increasing. In 1847 they exceeded the returns of any former year, and averaged considerably above the number of Scotch admissions. The subjoined numerical statement, taken in part from Dr Orr's paper, will illustrate this subject more fully.

1847.	Irish.	Scotch.	English.	Others.
Royal Infirmary, ...	3106	2094	15	9
City Hospital, ...	1326	896	38	0
Barony Hospital, ...	884	890	25	7
Total,	5316	3880	78	16

The residence in Scotland of the Irish treated in the infirmary was various, and may be judged of from the following round numbers. One-third of the whole were discovered to have been resident in Glasgow for more than five years, another third to have been from one to five years, while the remainder were not resident above twelve months. As our poor law possesses no power by which it checks effectually this wholesale system of pauper inundation, the safety of the community as well as the efforts of native industry, demand that some means be taken to mitigate, since they cannot eradicate the evil. Such are only to be found in the immediate adoption of salutary and comprehensive measures of sanatory reform. So much has been written and so little has comparatively been done in connection with this subject, that it is almost superfluous to dilate further on its necessity. The public mind in occasions of national distress is forced to become cognisant of the malady, and invariably addresses itself to some potent measures for preventing its future recurrence. Pamphlets are circulated, public meetings are held, and the newspaper press teems with articles written with the very best intentions, never to be verified by experience. A period of comparative prosperity ensues, when the epidemic returns to its old state of trivial prevalence, and the temporary excitement is followed by a corresponding apathy, to be awakened in due time by the visitation of another, perhaps a severer scourge.

ART. VI.—*An Account of the History, Nature, and Causes of Apparitions or Spectral Illusions, with Original Cases. By* R. PATERSON, M. D., F. R. C. P. E., &c., one of the Physicians to the Royal Infirmary of Edinburgh, and to the Leith Dispensary, Humane Society, and Casualty Hospital, &c.

DEFINITION AND HISTORY.

APPARITIONS, Spectres, Spectral Illusions, and Phantasmata may be defined to be vivid deceptions of the different senses, especially that of sight, often assisted by external means, occurring with such a degree of distinctness as to give a temporary belief in their reality; during a state of nervous excitement, and while the circulation of the brain is in a more or less disordered condition.

In other words, they are ideas or recollected images of the mind, referred to the respective organs of sense, and occurring with sufficient intensity, to create astonishment and often fear. All the senses are liable to be deceived in this way, and various substances, to be afterwards mentioned, would seem to have the power of producing these deceptions.

There can be no doubt that, in the earliest periods of human society, mankind were acquainted with the doctrines of true religion. The sacred writings, as well as those of historians cotemporary with and subsequent to them, present convincing evidence of the truth of this fact. There can be no doubt, also, that, in process of time, as the human race was multiplied and divided itself into groups and families, and were scattered over the face of the earth, they degenerated from their original faith, lost much important knowledge, and fell into a state of barbarism. If they knew not the true God, they believed in and worshipped other gods, the offspring of superstitious belief, or of their own fancy; and it appears to me that, at this point of the history of the human race, we can trace the first evidence of apparitions, or visions, in the origin of heathen mythology.

In this barbarous condition of society, there seems to have been but a very slight idea of the existence of a soul or spirit. The Africans near the Cape of Good Hope reproach their friends when they die for leaving them; and the rude Morlachians expostulate with their deceased relatives, and inquire of them why they are offended and forsake them. As it was difficult for the minds of men sunk in ignorance and barbarism to conceive that a brave warrior, or wise counsellor, a wife endowed with grace and beauty, or a husband prudent, sagacious, and affectionate, should pass at once into a state of non-existence, they conceived that these became thin aerial substances or spirits, and they endowed these spirits with similar feelings, affections, and virtues to those which the earthly prototype had possessed. A renowned warrior, therefore, was supposed still to take an interest in deeds of arms, and through his spiritual instrumentality to be the means of assisting and protecting his warrior friends in the time of need. It ought not, then, to be matter of wonder, that, previous to a doubtful contest, they should have applied to and supplicated the assistance and protection of this spiritual being. Excited by their devotions, it is probable that they called up in their minds an apparition of the god of battle, suited to their own ideas of his form, vigour, and beauty. Hence we have types of the gods and goddesses of heathen mythology,* having their origin in pictures of the mind, associated with previous conceptions of individuals famous for their services during life to their fellow creatures. An illustration of the above idea is to be found in the universal adoration of the ox in India and in Egypt, which most probably arose from its early use, subservience, and constant assistance to man in tilling the ground. This animal was therefore associated with plenty, and worshipped as the emblem of fruitfulness and abundance. The Jews, in imitation of the Egyptians, made a golden calf in the desert, and fell down and worshipped it. In the division of the kingdoms of Judah and Israel, Jeroboam erected two altars, the one at Bethel and the other at Dan, and placed on each of these a golden calf, and there the Israelites worshipped.

We are told, too, that Jupiter was adored under the figure of a bull, which shape, the poets tell us, he assumed to carry off Europa. This fiction is of great antiquity, since Anacreon mentions it in one of his odes; and, indeed, there can be no doubt, that, from the earliest times, the ox was worshipped after the manner I have stated.

It was not possible, however, for every one to conjure up, by means of excitement and religious ceremonies, the image of the god or goddess whose instrumentality they wished to obtain. They therefore constructed images of their deities, and placed them in tents, huts, or temples,† there to be worshipped; and they appointed the men who were highest in esteem for wisdom and knowledge to conduct the devotional ceremonies Hence originated the priesthood, in whom, in process of time, became concentrated all natural and other knowledge. These, therefore, soon became the receptacles of learning, and hesitated not to apply the discoveries of art and science, along with deception and imposition, for the purpose of keeping mankind in a state of ignorance, credulity, and thraldom.

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* "Many are of opinion that temples owe their first original to the superstitious reverence and devotion paid by the ancients to the memory of their deceased friends, relations, and benefactors; and as most of the gods were men consecrated upon account of some public benefit conferred on mankind, so most of the heathen temples are thought to have been at first only stately monuments erected in honour of the dead."—Vol. i. p. 220, Potter's Archæologia.

† It would appear from the history of Greece, that the earliest form of temple was a hollow tree in the forest, in which was placed the image of the sylvan deity.

Soon after the establishment of temples for the worship of the gods, we find that the calling up of spirits and apparitions was amongst the most common means resorted to in order to influence the minds of superstitious votaries; and when we consider the effect that the distinct and brilliant appearance of a god would have on the minds of ignorant men, we do not need to wonder at the universality of the belief. Accordingly, we find, that as the temples were famous for the frequency of such apparitions, so were they held in high repute, and resorted to by numerous votaries. In the temple of Esculapius at Tarsus, it is said that the god frequently manifested himself to his worshippers. Cicero mentions frequent apparitions of the gods in heathen temples; and Varro, quoted by St Augustin, affirms, that Numa and Pythagoras beheld images of the gods in the water; and that this kind of divination, as well as the art of causing apparitions of the dead, had been brought from Persia into Italy. There was a temple of Enguina in Sicily, which was often favoured by the apparition of the goddess mothers; and in the temple of Hercules at Tyre, there was a particular seat, made of consecrated stone, from which the gods arose, or, in other terms, from which miraculous apparitions appeared to arise.

A very amusing account of the clumsy way, in which communion with the gods was held in China, is given by an ancient writer. "On the road from Osacca to Sorungo, stands the *colossus* of one *Dubis*, made of brass, to whom they make an offering every month of a spotless virgin, who is instructed to ask the god such and such particular questions, to which the idol itself, or the devil, or perhaps some ronga (or priest), as the image is hollow, condescends to give her an answer. The sacred interpreter of this deity never fails to impart to the inquisitive virgin that qualification which makes a maid a woman, as the demonstration of the appearance of her god in human shape." And the same author details the account of an Egyptian priest of Saturn, who carried on an imposition of this kind for a length of time with success. It would appear that in this instance the image of the god was hollow, and that the cunning priest had a subterranean communication with it; and the author remarks, "that while the responses were given, the amorous priest of Saturn always took care to put out the candles,"—instances of simplicity, ignorance, and credulity, on the one hand, and of imposture, cunning, and sensuality on the other. From the artificial production of images of the gods to the apparition of deceased relatives and friends the transition is natural and easy.

The art of causing apparitions of the dead, therefore, comes next to be mentioned. It appears that the heathen temples were resorted to for this purpose; and if it could not be obtained, they were obliged to be content with a simple verbal response delivered from the invisible spirit of their friends, or through the medium of the priest or priestess. The origin of this idea may be traced to the superstitious beliefs of the Egyptians, who were followed by the Greeks, and subsequently by the Romans. The souls of the dead, according to them, had a power of revisiting the earth and appearing to the living, and they believed that the magicians and priests had the power of calling them up at will, and that these spirits were capable of foretelling future events. "The end of magic," says Iamblichus,* "is not to create beings, but to cause images resembling them to appear and soon again vanish, without leaving the slightest trace behind them." It would appear that some opinion of this kind had also existed in the early period of Jewish history; for we find in the Mosaic records various passages in which sorcery, divination, and magical incantations are strictly forbidden. It was sinful to believe in them, says an ancient writer,† and still more so to delight in or have recourse to them; and there can be no doubt that such arts were in use amongst the Jews in early times. We have only one instance recorded of the particulars of the art of the witch or sorcerer, in calling up an apparition of the dead, in the Old Testament. We quote it, as it is of much importance to our subject. The account which we have of it in the sacred writings is simple and concise.

Saul,‡ the king of Israel, had issued a decree, ordering all witches and sorcerers to be destroyed. In his fear for the event of a battle with the Philistines he is forsaken by God; and Samuel, to whom he was wont to resort for advice, was dead. Then Saul went to a witch, or woman who had a familiar spirit, at Endor. "Then said the woman, whom shall I bring up unto thee? and he said, bring me up Samuel; and when the woman saw Samuel, she cried with a loud voice, saying, why hast thou deceived me, for thou art Saul? And the king said unto her, be not afraid, for what sawest thou? And the woman said unto Saul, I saw gods ascending out of the earth. And he said unto her, what form is he of? And she said, an old man cometh up, and he is covered with a mantle. And Saul perceived that it was Samuel, and he stooped with his face to the ground, and bowed himself." Then follow the prophetic words which the apparition of Samuel uttered.

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* De Mysteriis.

† The Ceremonies and Religious Customs of the Various Nations of the Known World, p. 38. Lond. 1741.

‡ I Samuel xxviii. 11.

The above passage has given rise to much discussion and comment.

Some suppose that an apparition resembling Samuel was called up by the woman, who had most probably been warned of the approach of Saul, who knew well that the Israelites, in all their difficulties, were in the habit of having recourse to Samuel when alive; that most probably it would be the spirit of Samuel that the tall stranger, whom she could have little difficulty in recognizing as Saul, would require at her hands; that by her arts she summoned up an apparition resembling Samuel; and that the words which were delivered were the result of her own powers of ventriloquism or of an accomplice.

Theodoretus and the Rabbins account for the terror which seized or was feigned by the sorceress on the occurrence of the apparition of Samuel, by its having appeared in an upright position, while those of the spirits usually conjured up were reversed. Dr A. T. Thomson thinks it more probable that her dread arose from the fear of punishment by Saul; and that when the apparition spoke, it was probably the effects of ventriloquism. M. Salverte is of the same opinion; while others, and probably the largest class of commentators, contend that Saul, under the influence of fear of the approaching battle with the Philistines, consulted the sorceress. She was no doubt previously made aware who was to consult her, and whom he most probably would wish to see. She went on with her arts of deception and imposture. She then said she saw gods ascending out of the earth (which by the way was no uncommon appearance, the result of art), and that he represented an old man covered with a mantle. Here it is supposed the process of deception ended; and the miraculous appearance of Samuel took place, with confusion both to the witch and the king of Israel.

Josephus also describes the appearance as really that of Samuel. Whatever view we may be inclined to take of it, there can be no doubt that it is the first notice that we have of the particulars of the conjuring up of an apparition in ancient times.

Amongst the Greeks, the same processes seem to have been exercised by the priests, sorcerers, and magicians; and it appears, that they had places specially consecrated to the invocation of the dead. The oracle of Aornos in Thesprotia delivered responses by calling up the dead.

Homer describes, in the eleventh book of the Odyssey, the admission of Ulysses into a nekyomantion or divining-house, for the purpose of conversing with those friends who had been recently separated from him by death. An innumerable host of apparitions, and a terrific noise, interrupted the marvellous discourse.

It is said of Socrates, that he fancied himself constantly attended by a demon or guardian spirit, and he conceived that it was to it that he principally owed his wisdom and philosophy.

Among the last specimens of invoking the spirits or apparitions of the dead among the Greeks, was that of Cleonice, who appeared to her murderer Pausanias. Remorse and love drove this prince to a nekyomantion. There the psychagogues or sorcerers summoned up the shade of Cleonice to appear before him. The ambiguous answer he received from her might be interpreted either as conveying the pardon of Heaven for his crime, or the announcement of a violent death.

From the time that we have a pure and authentic history of Greece, the art of invocation seems to have been on the decline. The human mind, amidst other improvements, was becoming more alive to the nature of the impositions that were liable to be practised in the evocation of apparitions; and we find an instance of failure recorded, which shows that at that time the custom of consulting nekyomantia was falling into disgrace. Elysius of Therina having lost an only son, and desirous to invoke the spirit of this beloved child, unexpectedly visited a psychomantion; but as there was no time to get up an apparition similar to the object of his affections, the bereaved father was obliged to rest satisfied with a response, which declared death to be the greatest boon.

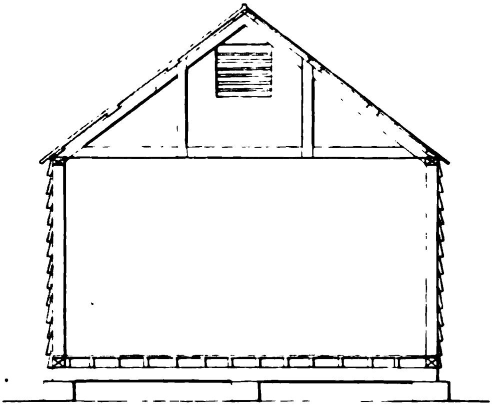
This art amongst the Romans seems to have existed to a later period of time. At the close of the Republic, when Cicero wrote, the art was practised in Rome; and two centuries later, we learn that Caracalla invoked the shades of Commodus and Severus. Lactantius, in the third century, positively represents the magicians as always prepared to convince the sceptical by "*apparitions of the dead.*" Even in the ninth century, the Emperor Basil of Macedonia, in his grief for the loss of his son, had recourse to the prayers of a priest. He conjured up to him the apparition of his lost son, superbly arrayed, and mounted on a fine horse; but as the father rushed forward to embrace his spectral son, the figure disappeared. But, indeed, the practice of producing images of deceased or distant individuals, is not confined to the ancient history of the Jews, Egyptians, Greeks, and Romans. We find traces of it throughout most eastern nations, and probably even among those of more northern climes. In India, the priests, magicians, and sorcerers were in the habit of producing in their temples, or at their own abodes, the images of distant or lost relations, and even of allowing the votaries to ask questions and receive answers.

Having said so much about the conjuring up of apparitions of gods and individuals in ancient times, it may be well shortly to state the means which modern science has demonstrated to have been put in use for purposes of the kind. Knowledge was entirely the property of one caste, and their deceptions, which must often have been clumsy enough, were much favoured by the ignorance of those early ages. The secresy, too, in which discoveries and remarkable inventions were kept, for purposes of imposition, has prevented us from receiving such decided testimony of the means used as we could have wished. Enough, however, has been handed down to show that almost every different department of science contributed its wonders to the magician's budget.

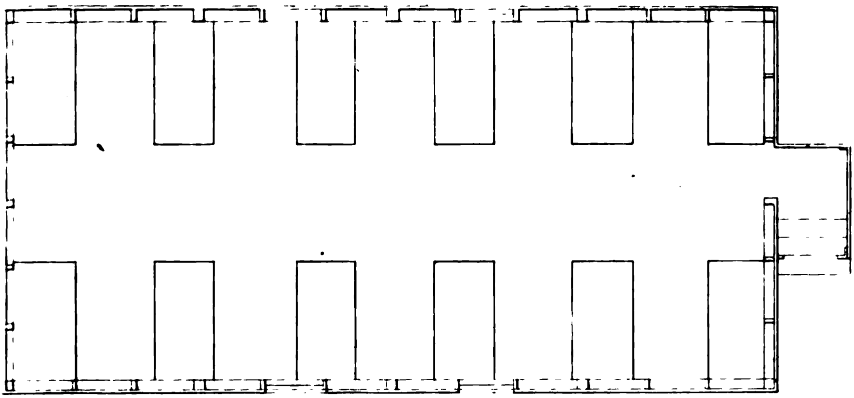
First of all, we must mention a certain amount of preparation which seems to have been necessary to enable the votaries to behold apparitions. These, we are told, consisted of certain fastings, bathing, anointing, and taking of potions; and when they were admitted into the apartment for the purpose of witnessing the phenomena, certain substances and perfumes were burnt before them. I shall afterwards have occasion more particularly to refer to this subject, and to discuss the nature of the different substances which have the power of producing visionary appearances. Suffice it at present to say, that we know certain vegetable and mineral matters, that when taken internally, or rubbed on the body by means of liniment or ointment, or, when burnt, and inhaled in the form of vapour, have the effect of causing images to appear before the individual. I shall also have occasion afterwards, more particularly, to explain, that during the use of such drugs, the image which has most recently and constantly occupied the mind, is generally manifested.

With such preparations, the science of optics was next called into play. Mirrors, lenses, and the camera, and the effects of light and shade, as in the beautiful pictures of the Diorama; the art of bringing the remotest objects within the very grasp of the observer, and again, of presenting the appearance of great distances, as in the Diorama; the power of a series of mirrors, placed in different apartments, and the effect of throwing the images presented before them upon a flickering column of smoke, or on water, or on consecrated polished stone; the effect of combinations of lenses in making almost invisible objects swell into gigantic magnitude, and again become minute; the rapidly changing scenes of the magic lantern, as well as other optical phenomena, too numerous to be here mentioned, could not fail to make a strong impression on ignorant minds, and to inspire with astonishment and awe, those who were most deeply interested in the process going forward.

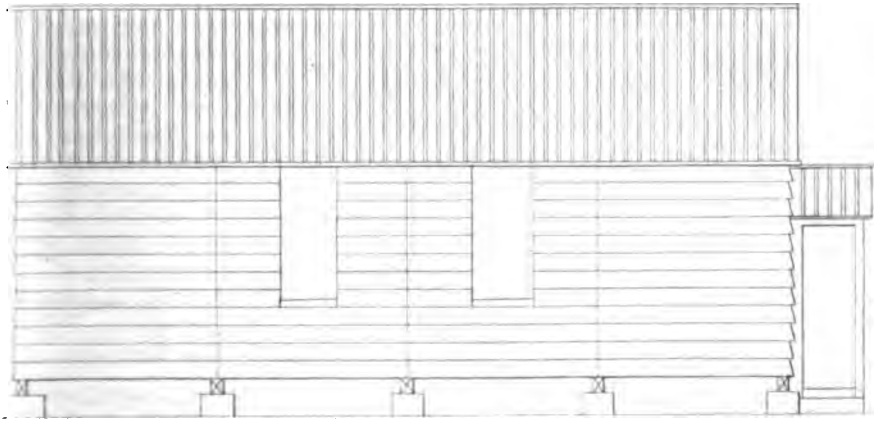
But the science of acoustics was next called into action. The



TRANSVERSE SECTION



PLAN



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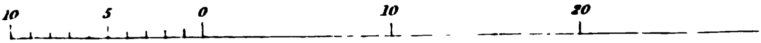

imitation of thunder in the subterranean temples, indicating the presence of supposed supernatural agency; the powers of ventriloquism, which have been long known to barbarous nations;* the effect of modulations of the human voice as spoken from the interior of hollow images, and of softened music on the imagination, must have produced a striking impression on the minds of the votaries.

"Thus," says Dr Brewster,† "the golden virgins, whose ravishing voices resounded through the temple of Delphos; the stone from the river Pactolus, whose trumpet notes scared the robber from the treasure which it guarded; the speaking head which uttered its oracular responses at Lesbos; and the vocal statue of Memnon, which began at break of day to accost the rising sun—were all deceptions derived from science, and from a diligent observation of the phenomena of nature."

These departments of science each and separately produced phenomena of a sufficiently striking nature even in our own day. What effect, then, must a combination of these have had in places set apart for the purpose, and where every accessory department of art was called in to aid the deception?

In more recent times, we find the idea of apparitions occasionally manifesting themselves to be a prevalent belief. The particular opinions which philosophers entertained regarding the nature of the soul, or spiritual essence, materially modified the view which they formed of spirits. It was generally believed, however, that spirits were allowed to manifest themselves to the bodily senses; and, indeed, the beneficial and malignant spirits of the Platonic philosophy differ little from the good and evil angels of the early Christian belief. An attempt had previously been made to account in a rational way for the occurrence of ghosts and apparitions, in contradiction to the universally believed Platonic doctrine of the day, by Lucretius, the pupil of Epicurus. He supposed that all bodies in nature give off attenuated films, crusts, or pellicles, like the skins and exuvia of reptiles, and that it was in the giving off of these that ghosts and apparitions were observable. This attempt to combat the popular belief in ghosts, or spirits returned from the mansions of the dead, "was propounded," says he, "for the purpose of showing mankind that all things are corporeal and dissoluble, not even excepting the soul itself; and thus opposing the popular belief in incorporeal beings, which had thrown horror and dread over the world."

The Materialists, however, soon turned this doctrine to their own account; for we find Psellus, and subsequently Paracelsus, both contending for the materiality of demons, and the latter for four kinds of them, "spirits, nymphs, pigmies, and salamanders," according as they inhabited the different elements. The Jews and early Christians believed in good and evil spirits, and their superstitions differ little from that of the Greeks and Romans.

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* The Esquimaux even would seem to have their exhibitions of this kind.

† Brewster's Letters on Natural Magic, page 4.

At a much later period of Christianity, however, we find more decided doctrines established relative to the origin and nature of demons. The Church of Rome adopted and methodized the mythological traditions of the Pagans, as well as the legends of the Talmud, and thus gave origin to a system of demonology, which grew to such a monstrous height during the middle ages, as completely to overwhelm Christianity under its revolting and extravagant fictions. At this period, the belief in apparitions was universal, and the most incredible absurdities and grotesque fooleries which the human mind ever imagined, were propagated by the Church of Rome.*

Dr Balthazar Bekker, a protestant clergyman, at Amsterdam, published in 1694 a work, in which he made a most vigorous attempt to explode the monstrous absurdities of the period; and he was closely followed by Thomasius, in 1701, in his inaugural dissertation, and subsequent work, "de Crimine Magicæ." When we consider that all kinds of apparitions, demons, devils, witchcraft, &c. &c., had become part of the Romish faith at the time, we cannot too highly prize the noble attempt which Dr Bekker made to free his fellow-mortals from the thraldom of such a creed.

Even the Reformation, which eradicated so many errors, and dispelled so many prejudices and delusions, left this one as hideous as ever. The devil, or the spirit of evil, was supposed to be constantly stalking about, and occasionally manifesting himself in a bodily form to delude mankind. An interesting instance of an illusion, connected with such feelings, and during the excitement of a change of religious opinions, is related by Martin Luther of himself. "Being at prayer, and contemplating how Christ hung upon the cross, and suffered for our sins, there appeared suddenly on the wall a bright shining vision, and thereon appeared also a glorious form of our Saviour Christ, with his five wounds, steadfastly looking upon him, as if it had been Christ himself corporeally. Now, at the first sight, he thought it had been some good revelation; yet presently recollected himself, and apprehending some juggling of the devil, (for Christ, as Luther says, appeareth unto us in his word, and in a meaner and more humble form, even as he was humbled on the cross for us), therefore he spake to the vision in this manner, 'Away thou confounded devil; I know no other Christ than he that was crucified, who also, in his word, is pictured and preached to me.' Whereupon the image vanished, which was the very devil himself."*

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* The observations of Cornelius Agrippa, who wrote in 1575, may be here quoted. I shall give them in his own quaint language. Writing of witchcraft, sorcery, necromancy, and supernatural appearances generally, he says, "They have made the patriarchs and the angels of God authors of detestable doctrines. Their books, words, and ceremonies, their foolish phrases, contain nothing else but mere trifles and falsehood, and to be made in these latter times by men ignorant of ancient magic, most damnable artificers of damnation, of certain wicked observations interlaced and grafted in the confusion of religion with many unknown names and signs; to the end to frighten rude and simple men, and to engender marvel in fools, and in those which know not good letters. It doth not yet manifestly appear that these arts be fables, for except they were indeed (so), by means of them many marvellous and noisome things might be done, the divine and human law would not so straitly have commanded that they should be banished from among men." Page 58.

Modern science, and the investigations of philosophers, have shown that apparitions or spectral illusions occur in great varieties of form during certain states of bodily indisposition and excitement; and we can now explain the apparition of Luther without the intervention of the devil, by supposing it to have been a spectral illusion of the object of his contemplation at the time, and during a state of intense mental excitement with slight bodily indisposition.

I have not mentioned the instances of apparitions in the later periods of ancient times, for the reason, that it is impossible to clear them of the imposition and superstitious belief of the age. Thus, the apparition which was presented to Brutus before he came over from Asia, and again, before the battle of Philippi, were obviously dreams.

The case of Dion, to whom, according to Plutarch, a similar apparition appeared, the one which appeared to Cassius Severus, the poet, before he was slain by order of Augustus, and also that of the Emperor Julian, all may be accounted for on like principles. The apparition which appeared to Cornelius Scylla, and accosted him by name, was obviously the result of fever, of which he died the following evening.

Many others might be quoted, occurring during the times of which we speak, as well as during the middle ages, and even as late as the eighteenth century, conjured up by the workings of an excited imagination, acting on the organs of sense, and which superstition taught to be the harbinger of coming events, the mind being unenlightened with a sound or rational philosophy.

In 1799, Nicolai, the celebrated bookseller of Berlin, read before the Royal Society of that place, an account of spectres or phantoms, seen by himself, and arising from a disordered state of his constitution. This was the first attempt to explain the appearance of such phenomena after a rational manner; and went far to dissipate the belief in many supernatural appearances.

The knowledge of phenomena of this kind, as well as much subsequent information on congenial subjects, which has been since collected, struck a decided blow at the dominion of superstition; add to which, the persecutions for witchcraft, the many innocent victims that suffered on the scaffold, at stake, and by torture, at that shrine, by degrees turned the minds of all thinking men from the supernatural to the investigation and study of such phenomena by nature's laws.

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* Quoted by Dr Hibbert and others.

A popular work has lately appeared from the pen of an able writer, in which the supernatural view of spectral phenomena is adopted; and I cannot but regret its appearance, seeing that it may be the means of reviving popular superstitious notions so nearly exploded. It is easy to throw an air of mystery over the most common-place occurrences; and accidental coincidences following upon such, give them a colouring which lead many to put them down as cause and effect. If we consider for a moment the number of curious coincidences which are always occurring, unconnected with dreams or visions, and when we further consider the number of apparitions which occur, and are not followed by any result, there is little ground left to put down, as the result of cause and effect, the comparatively few instances of which we occasionally hear, of individuals seeing visions which are afterwards realized. While it is a duty, however, carefully to investigate all such cases, and neither to lean too much to the one view or the other, we should always keep in mind, that it is best to adopt, when both are nearly equal, the philosophical one, and the one which can be explained without infringing nature's laws.

Having said so much of ghosts and apparitions, I cannot conclude these preliminary remarks without quoting the observations of Dr Brown, in the view he has taken of superstitious impressions, more especially as regards instances of what is called second sight, and with which I perfectly coincide. "In the second sight of this northern part of the island, there can be no doubt that the objects which the seers conceive themselves to behold are truly more vivid as conceptions than but for the superstition and the melancholy character of the natives, which harmonize with the objects of this foresight, they would have been; and that it is in consequence of the brightening effect of this emotion, as concurring with the dim and shadowy objects which the vapoury atmosphere of our lakes and valleys presents, that fancy relatively to the individual becomes a temporary reality. The gifted eye which has once believed itself favoured with such a view of the future, will, of course, ever after have a quicker foresight and more frequent revelations."

There can be no doubt, that a vivid imagination under excitement, and in countries situated, as Dr Brown remarks the northern ones to be, are the causes of certain individuals being able to dress up their fancies in such a shape as to present them before themselves and others as realities.

Dr Abercrombie, in speaking of the stories of second sight, supposes "that they consisted of spectral illusions arising out of strong mental impressions, and, by some natural coincidence, fulfilled in the same manner as we have in regard to dreams."

PATHOLOGY.—Before proceeding further, it may be well to consider the pathological states of the system which are present when apparitions or spectral phenomena are witnessed.

This subject has been discussed by Dr Alderson, Dr Ferriar, Dr Hibbert, and my friend Dr Craigie of Edinburgh. Dr Hibbert, who has given a most elaborate account of the pathology of spectral illusions, arranges them according as they arise from a highly-excited state of different temperaments, from plethora, from hectic fever, from febrile and inflammatory affections, from inflammation of the brain, connected with an exalted state of nervous irritability, from hypochondriasis, and from gases, narcotic poisons, &c. &c.

Dr Craigie has given an able digest of the whole subject, the result of which, in his own words, is, that spectral images are seen chiefly in three states of the system; *first*, either when the stomach is disordered, and digestion has been more or less deranged; or, *secondly*, when there is a congestive or irritative state of the cerebral membranes; or, *thirdly*, when both states are combined.

Several objections may be urged to both of these arrangements. In many of Dr Hibbert's the same pathological condition exists; while in Dr Craigie's division the disordered digestion acts only by deranging the cerebral circulation.

It is to this latter, or a want of balance in the circulation within the head, that spectral phenomena are chiefly to be ascribed. In consequence of the unyielding nature of the cranial case, no great amount of difference in quantity can, under any circumstances, exist in the contents of the blood-vessels within the cranium; but there may be a relative want of proportion in that of the arteries and veins, giving rise to a want of balance in the circulation; or the cranial contents may be susceptible of compression and expansion to a slight degree, according as there is actually more or less blood in the circulating vessels. This explanation of the phenomena I am inclined to adopt. This want of balance is what I contend for, and I am therefore inclined to refer them all to three heads according as they arise—1*st*, from increased quantity of blood in the circulating vessels; or, 2*dly*, from a diminished quantity; and, 3*dly*, from certain foreign matters circulating with it.

Some physicians are inclined to question whether my third division is necessary,—whether, in fact, the action of substances taken into the blood, and which produce spectral phenomena, do not produce them in virtue of their causing an increased determination to the cerebral vessels. This division, however, I still think to be necessary. It is true that alcohol, ether, chloroform, and various gasiform substances, when admitted into the blood, do produce a certain amount of increase in the contents of the cranial vessels. With this we are all familiar in the more forcible throbbing of the arteries, the increased heat of head, and the injection of the capillary vessels of the conjunctiva, in those who have been taking alkohol or chloroform; but there are other vegetable and probably mineral substances which do not seem to produce such determinations; in fact it seems to be their simple presence in the blood which produces this symptom. To this class seem to belong the different species of solanum, of datura, of cannabis, and of the substance called coqua.

To the first head are to be referred the illusions of fevers, of delirium tremens, plague, of inflammatory affections of the brain and its membranes, and most probably of mania, of plethora, gout, hypochondriasis, and hysteria. To the second head are to be referred those which occur in weak excitable temperaments after continued illness and low diet, after large blood-letting to approaching syncope, as well as some of those which take place towards the termination of phthisis, hæmoptysis, &c. To the third head may be referred the apparitions which sometimes arise from the absorption of alkohol, ether, chloroform, and substances of a like description by the circulating current, as well as the inhalation of certain gases, and, as would appear, and I shall more especially notice afterwards, from preparations of sulphur with oxygen and carbon, and, lastly, various narcotic poisons, such as opium, belladonna conium, hyoscyamus, solanum, cannabis, and similar drugs.

As instances of the first head, we are all familiar with the illusions of fever, delirium tremens, and inflammation of the brain and its membranes; and there are some curious cases on record of the first premonitory symptoms of the occurrence of these disorders being spectral illusions.* Nicolai's apparitions arose from plethora, and yielded to a local blood-letting. The apparition of the hag with the crutch, which appeared to Dr Gregory's patient, yielded also to a blood-letting and low diet.

Instances of the second head are also numerous, and the case of Mrs A., related by Dr Brewster, would seem referable to this. Dr Craigie mentions an interesting case of spectral illusion ensuing on the great loss of blood, employed to check a profuse hæmoptysis; also, one which followed a large blood-letting for puerperal fever. We are all familiar with it as an accompaniment of syncope, and also as an attendant on diseases accompanied with extreme exhaustion. One or two of the instances shortly to be related exemplify this division of the causes of spectral phenomena.

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* Abercrombie on the Intellectual Powers.

Of instances of the third class, or those arising from the absorption of foreign matters into the blood, I shall come to speak more fully afterwards. It would appear, however, that the pathological states which I have been considering will not of themselves produce the phenomena under discussion. Thus many individuals labour under plethora, and go through the course of fever without seeing a single spectral appearance. Many individuals faint, too, and have their systems reduced to the lowest ebb, both slowly and suddenly, by disease and by rapid and large blood-lettings, without ever seeing a single phantasm; and many individuals can take opium, morphia, or hyoscyamus, without any appearance of the kind manifesting itself. What then is the state which seems to predispose some to see apparitions under the slightest form of exhaustion or deranged health, on the occurrence of faintness or the use of narcotic herbs? It may be termed a state of predisposing nervous susceptibility, marked in general in those of the sanguineous and melancholic temperament, who are easily excited, and often in those who are much occupied with the contemplation of the workings of their own minds.

DIVISION OF SPECTRAL PHENOMENA, AND EXPERIMENTAL ILLUSTRATION.

As apparitions or spectral illusions are resolvable into ideas or images of the mind, dressed up and impressed on the bodily senses with a vividness which often creates astonishment and fear, so external means often deceive the imagination in like manner, and give rise to phenomena of a very similar kind.

They may therefore with propriety be divided—

First, into those which have their origin in the mind itself;

And, *Secondly*, into those which are entirely referable to external circumstances.

That apparitions have their origin entirely in the mind, independent altogether of external circumstances, and are in fact but vivid ideas, or recollected images, can be proved experimentally.

Thus we can trace, step by step, the continuation of an impression on the retina, the manner in which it can be renewed for a time, the way in which it can be revived at will, and occasionally appear involuntarily, to the astonishment and often alarm of the individual himself.

The familiar instance of looking at the sun in a mirror, and then turning the eye into a dark corner of the room, when the disk of the sun which has just been beheld will be replaced by the spectral image of it, can be produced experimentally by any one. Or we may reverse the experiment with the same effect in this way;—the attention being strongly fixed in contemplating a well-marked dark object, such as the vane on the top of a mast, with a bright moon behind it, and this being kept up for a time,—if the eye is immediately turned to a white cloud, or upon a sheet of white paper, the image of the object on the vane will be strikingly depicted there also.* In these instances it must be observed, that although the image of the sun and object on the vane is a spectral one, yet it is only to be considered as a continuation of the impression left by the object on the retina. A step farther in the process, however, can also be easily demonstrated experimentally; and that is, to recall at will the spectral image of objects of the kind above mentioned. This is easily accomplished, by repeating frequently and continuously the above experiments; when, very soon, without at all turning the eye either to the sun or object, the spectre of it can be conjured up at will, by simply thinking upon it, or picturing it, as it is called, in the imagination.

Sir Isaac Newton, after some experiments of this kind, was so haunted with the image of the sun, that he durst not think or direct his attention in any way to it for months without the bright image of it appearing before his eyes, along with its rings of spectral colouring. So are we all familiar with the mode of producing objects or pictures which have deeply impressed our fancy in reveries, or, as they are called, waking dreams. Objects which have not been seen for years, when the mind is intently fixed upon them, appear before the eye with all the distinctions of outline and breadth of colouring which struck the individual when he first looked on them, and which for a time efface the real object of vision. "If we look," says Dr Brewster, "at the façade of St Paul's, and without changing our position call to mind the celebrated view of Mount Blanc, from Lyons, the picture of the cathedral, though actually impressed upon the retina, is momentarily lost sight of by the mind exactly like an object seen by indirect vision; and during the instant the recollected image of the mountain, towering over the subjacent range, is distinctly seen, but in a tone of subdued colouring and indistinct outline. When the purpose of its recall is answered, it quickly disappears, and the picture of the cathedral again assumes the ascendancy."

To this principle of renewal of impressions formerly made by different objects, belongs the idle amusement of tracing pictures, landscapes, &c. on the discoloured spots of an old wall. An interesting instance of this kind was the first thing that forcibly struck Mr Z., one of the cases that I am presently to relate. He was reclining one afternoon on a sofa in a room, the windows of which looked out on the blank gable of a house opposite. His mind was recalled to some circumstances which had occurred at the time of the reform processions in this and other towns, when to his astonishment he beheld the very scene before him as brilliant as he beheld it on the day on which it occurred, or it could have been depicted on canvas. The range of houses, with their tops crowded with spectators; the windows, with ladies waving handkerchiefs; the crowds on the street; the banners of the procession; the dragoons; even the little ragged boys that threaded the crowd, were all most brilliantly formed out of old stone and lime; nay, more, the procession moved on, until, while turning round the corner of a street, his mind accidentally changed the subject, and the whole disappeared.

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* This was actually seen by the subject of one of the cases which I recorded in a former paper, and was amongst the first symptoms that he observed in the course of seeing spectral phenomena. Another experimental demonstration of this occurred to him; the appearance of a row of lamps struck him as beautiful, deeply impressed his imagination, and on turning his eye involuntarily to a dark cloud on the horizon, he beheld the row of spectral lamps prominent from the dark cloud.

The ancient Pyromancy or delivering of omens from observing the fire, the sparkling of a flame or lamp, had most probably its origin in assisting the fancy of the priest or priestess by renewing impressions or giving origin to ideas. Thus we are told that, in the temple of Minerva at Athens, they kept a lamp always burning, fed by virgins, who regularly observed the motion of the flame. We are also told that, when these lamps failed in giving an omen, the priests were in the habit of throwing pitch into the fire, and that often from the flames, sparks, and smoke many auguries were delivered; and it is recorded that the faithful wife of Protesilaus importuned the gods to grant her one sight of her husband, who had fallen on the shores of Troy. She no sooner saw the apparition than without hesitation she endeavoured to follow him by precipitating herself into the flames, and was destroyed.* In this instance it is probable that some noxious drug had been previously administered to her for the purpose of exciting in her mind a tendency to see spectral forms. These drugs were often uncertain in their effects, and produced a desire in the individual to rush forward like a frantic person. I have previously explained, too, that the apparitions which are in general seen under those circumstances are revived impressions of what had been previously studiously observed, and made a deep impression on the mind of the individual before anointing with, inhaling, or swallowing the potent drug. Baxter, in his inquiry into the nature of the human soul, maintains that external beings and things may directly impress the fancy with delusive scenes, without the intervention of sleep, and may intrude thus forcibly upon the mind amidst the action of external objects.

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* Banier's Mythology, vol. i. p. 595.

The childish amusement in our times of tracing pictures in the fire must be classed amongst the same phenomena, and it will generally be noticed that they bring back a picture of objects which have most delighted or impressed the youthful imagination. This power has not been forgotten by the talented Mr Dickens* in his beautiful delineations of humble life. Most of us must have been struck with his impressive account of the poor man at the furnace fire, who found comfort and consolation alone in looking at it, as in it he was able to depict former joyous scenes of comfort and happiness, and even in the roar of it to hear the voices of his lost relations and friends. It told the only tales he could listen to, for it brought him back to youth, to home, and to happiness.

Thus, then, can we trace the phenomena by distinct links, from the spectral image of the sun to the grimmest apparition in nature;—nay, even to those apparitions which of yore assumed the form of demons and devils, being tainted with the superstitious belief of the times.

Dr Brewster has remarked, as a physical fact, "that when the eye is not exposed to the impression of external objects, or when it is insensible to those objects in consequence of being engrossed with its own operations, any object of mental contemplation which has either been called up by the memory or created by the imagination, will be seen as distinctly as if it had been formed from the vision of a real object." In examining these mental impressions, he adds, "I have found that they follow the motions of the eye-ball exactly like the spectral impressions of luminous objects, and that they resemble them also in their apparent immobility when the eye-ball is displaced by an external force. It follows then that the objects of mental contemplation may be seen as distinctly as external objects, and will occupy the same local position in the axis of vision as if they had been formed by the agency of light." The retina thus becomes the common tablet on which both classes of impressions are depicted, the mind's eye in fact being the body's eye.

In the healthy state of the mind and body the relative intensity of these two classes of impressions is nicely adjusted; the mental images are feeble, and never capable of effacing the direct images of visible objects. In darkness and solitude, however, when external objects are not so distinct, when the mind is excited by fear or the body by indisposition, the intensity of these mental impressions becomes greater, and thus it is that spectral forms are more commonly seen during twilight or approaching darkness. These spectres, says Sir D. Brewster,† are always white, because no other colour can be seen, and they are either formed out of inanimate objects which reflect more light than others around them, or of animals or human beings, whose colour or change of place render them more visible in the dark.

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* Humphrey's Clock. Old Curiosity Shop.

† Brewster on Natural Magic, p. 16.

CLASS FIRST.—APPARITIONS HAVING THEIR ORIGIN IN THE MIND ALONE.

Epitome of published cases of Spectral Illusions.

First on the list must be mentioned the visions of John Beaumont,[*] which were published in 1705. He attributed them to the visitation of spirits, according to the belief of the time. He saw them only during the day, or by moonlight, or by the light of a fire or candle. They were in hundreds, of both sexes, and he recognised the most minute parts of their dress. He heard them call him by name, speak to each other, and even on one occasion he felt them touch him.

There can be no doubt that Beaumont was a hypochondriac, and that these were the spectral illusions of this disease.

I have formerly mentioned the case of Nicolai,[†] the German bookseller, who saw figures both of deceased and living individuals, both when he was alone and in company, and while his eyes were open and shut, once or twice persons on horseback, dogs, and birds, the colours being somewhat paler than they are in nature.

Dr Alderson of Hull [‡] has detailed the case of the keeper of a dram-shop, who saw several very distinct spectral images, the result, probably, of a threatened attack of delirium tremens. The same author mentions the case of an old lady affected with gout, who was visited by spectral forms of many of her friends, both dead and alive, but which disappeared when any one entered the room. She could not hear them speak; but to her they appeared to converse together. Dr Ferriar of Manchester, in 1813,[§] next handled the subject, and has related several interesting cases of this kind.

In 1823 and 1825 Dr Hibbert read before the Royal Society, and subsequently published,[||] a very full and luminous account of the subject of apparitions, in which he brought much erudition and interesting information to elucidate the doubtful points. One original case in particular is mentioned, where a gentleman was told of the sudden death of an old and intimate friend. His mind reverted to the subject again and again, and in walking in the evening in a court behind the house, he became a witness to the image of his friend, attired as he had last seen him, but in a dress different from what he was wont to wear.

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[*] Treatise of Spirits, Apparitions, Witchcrafts, and other Magical Practices.

[†] Memoir on the appearance of Spectres or Phantoms occasioned by disease, with Psychological Remarks. Read by Nicolai to the Royal Society of Berlin in 1790, and translated into Nicolson's Journal, Vol. vi., p. 161.

[‡] Edin. Med. and Surg. Journal, vol. vi., p. 288.

[§] Theory of Apparitions, by John Ferriar. Lond. 1813.

[||] Sketches of the Philosophy of Apparitions. Edinb. 1825, p.470.

A writer in the Christian Observer for 1829 relates a striking picture of this nature. A gentleman having lost his wife under painful circumstances, was travelling during the night on horseback; the apparition of his lost relative appeared before him; he stopped his horse and contemplated the vision with great trepidation. The same vision afterwards appeared to him while sitting in his chamber and dwelling on his bereavement.

Sir Walter Scott, in 1830, published his Letters on Demonology and Witchcraft. In this work he has related a case of much interest, in which an individual was more or less constantly attended—first, by a cat; secondly, by a little precisely-dressed gentleman usher; and lastly, by the figure of death, in the shape of a skeleton.*

Sir David Brewster,† in 1832, published the remarkable case of a lady, Mrs A., who had both her sense of hearing and seeing oftentimes deceived. She heard the voice of her husband calling her by name; she saw him when he was not present; she saw the cat in more than one part of the room at the same time; she saw the figure of a relative, dressed in grave-clothes, looking over her shoulder while arranging her hair at a mirror; and also a spectral carriage-and-four come up the avenue to the house, and as they approached, both the horses, driver, and inmates of carriage, gradually turned into skeletons, &c.

Dr Abercrombie,‡ also, about the same time, detailed the history of some interesting cases of this nature. Dr Dewar of Stirling related to Dr A. the case of a lady, quite blind, who never walked out without seeing before her a little old woman with a red cloak and crutch. Dr A. Combe also related to the same physician the illusion of a girl in the service of a gentleman, who was not only a phrenologist, and had numerous busts in his house, but was also nautically inclined, and had a yacht. The sailors used to frequent the house. She saw an illusion of one of the busts at the foot of her bed, dressed up with whiskers like a sailor.

The interesting case of Mr R., published by Mr Craig of Ratho, and the very apposite remarks which accompany this paper, from the pen of my old and esteemed friend Dr Craigie, are most worthy of notice. This gentleman, whom we believe to have been Sir Robert Liston, a man of varied acquirements, of superior mental endowments, and a remarkable linguist, while he was in the seventy-sixth year of his age, and in the year 1819, began to see a variety of human countenances, with various dresses, but few of whom he knew. He had his own countenance occasionally presented to him. The figures were sometimes as large as life, sometimes very small, but always having the most minute detail of form and outline; on some occasions the back, and on others the front of the image was presented. They continued to recur for a series of twelve years; and the figures were always more frequent after the use of laudanum or wine. I have already adverted to Dr Craigie's observations on this most singular case.

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* Various instances are recorded, and several have been related by Sir Walter Scott, of individuals, who, having committed murder or other crimes, were so haunted by the spectral forms of their victims, that they were obliged to give themselves up to justice.

† Letters on Natural Magic. Lond. 1832. P. 39.

‡ Abercrombie on the Intellectual Powers.

A very remarkable case is related in the sixth volume of Hufeland's Journal. An intelligent person of great worth and literary habits was visited by a phantom of this kind, and soon afterwards by an assemblage of figures, several of whom were known to the gentleman, others not. The room soon became perfectly filled; he retired to his bedchamber, but they followed him; they disappeared during sleep, but on awakening, one after another glided in and filled the room as before. The case turned out very like Nicolai's; he was plethoric, was accustomed to periodical bleedings, and by means of which he was entirely relieved of his spectral visitors.

In 1843, I published* several cases of illusions of this nature, in which single figures were seen for fully half an hour continuously, and another in which an apparition of an old companion, long deceased, appeared to the gentleman, spoke to him, and touched him. This case is altogether a very remarkable one, as nothing was seen in the dark. He felt, however, the grasp of the apparition's hand on his arm, heard it speak, but did not see it till he lighted the candle. The figure glided gradually before him down stairs; he passed close to it at the door, became giddy, and fell down.

In another case, two females dressed in black glided past, one following the other, and proceeded through an iron gate at the foot of an avenue, without its being opened or shut. He afterwards saw some spectral asses grazing in a park, and so distinct were they that it was only on laying his hand on one of them that he discovered their nature.

Another illusion of this nature occurred to a friend of Dr Dunsmure's. He had been forcibly struck with the countenance and appearance of a respectable stranger, who expired suddenly in a public omnibus; and some time afterwards, while writing in his library, the vision of the dead stranger stood before him with much distinctness of outline; he remained a few minutes.

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* Edin. Med. and Surg. Journal, No. 154, p. 6.

Dr A. T. Thomson, in his notes to M. Salverte's work on the Occult Sciences, at p. 272, vol. i., relates the case of a hypochondriacal young lady, " who imagined that she was attended by a small black dog, which constantly ran by her side when she walked out, and sat on a table or chair near her at home."

HISTORY OF ORIGINAL CASES.

1. A lady about middle age, and of a robust constitution, had laboured under a prolonged attack of influenza. She had been confined for some weeks to bed, but was now in the dining-room and going about the house. Her father, a man of a striking aspect of countenance, of a most benevolent disposition, and much integrity of character, had been dead for several years. On the occasion to which I am about to refer, these circumstances had been forcibly brought to mind in consequence of her having fallen upon some letters of his—one of them having been written immediately previous to his death. Her mind was absorbed in contemplation, when she was suddenly summoned up stairs. She immediately left the room for this purpose, and hurried up stairs as fast as her weak state would permit her. Ere she had got half way, however, she felt a degree of faintness come over her, which compelled her to take hold of the railing of the stair and lean over it. In doing so, what was her astonishment to behold standing on the spot at the foot of the stair, which she had just but a moment before left, the image of her father, clad as usual, uncovered, and exhibiting his gray hairs. He seemed to gaze upwards towards her; and while she looked steadfastly at him she recognized the same benevolent countenance which characterized him while alive. This lady did not seem to have felt any degree of alarm at the apparition—for as such she put it down—and continuing to gaze steadily at it, it gradually became dimmer and dimmer, and finally disappeared. She had no return of the illusion. The case is simply explained. The lady was weak; was excited with the letters she had been reading; her mind was dwelling on her father; the sudden exertion produced momentary faintness, during which the image that had been previously occupying her mind assumed a bodily shape, and appeared to her in the dress and attitude she was most accustomed to see it while alive.

2. The next case was that of a professional man of middle age and active habits, and not addicted to the abuse of stimulating liquids. It would appear that he had been in the habit of seeing various forms of spectral illusions for some time after more than usual professional exertions or night watching. He has been all along perfectly aware of their nature, and sees them without the

slightest degree of fear, but, on the contrary, with interest, and often with amusement.

The first illusion to which this gentleman was subjected occurred after nearly three successive nights' want of sleep. On approaching his own door one evening, as twilight darkened into night, he became aware of the figure of a man standing at it whom he could not recognise as having seen before; he was commonly dressed, with his hand on the bell, and his face slightly turned, as if to observe the individual approaching. So clearly defined was the apparition that the gentleman immediately accosted it with the inquiry if he had rung the bell? No answer having been returned, a doubt at once seized him of the reality of the individual before him, and on putting forward his hand to take hold of the figure, it vanished. The same evening, on approaching the door of one of his patients, he recognised the figure, dress, and aspect of the same phantom; it stood at a distance from the door on this occasion, and quite motionless as before. Being quite aware of the nature of this appearance, he gazed fixedly at it for a time, rubbed his eyes, and closed them, still the apparition was there; it gradually, however, became fainter in colour and outline, and soon disappeared. It may be remarked that the whole of that day on which this gentleman saw the above-mentioned illusions everything seemed dim and indistinct to him, and he had often, especially as evening came down, to rub his eyes for the purpose of clearing them of a mistiness which every now and again came over them.

I do not propose to detail the numerous illusions which occurred to this gentleman. His friend of the door-bell frequently appears, sometimes with his hat on, sometimes without it, sometimes of minute and at other times of gigantic dimensions; his countenance is always the same.

Groups of children, too, occasionally present themselves before him, moving about as if amusing themselves. The only other illusion which I think it necessary to detail resembles more those seen by Nicolai, and the case in Hufeland's Journal, than any other of the kind on record. He was called one evening, under circumstances similar to those I have before alluded to, to visit a patient who lived on the second flat of a common stair. He rung the bell, and the door was shortly afterwards opened; it shut again immediately after his passing, in the usual way with doors of this kind. The common stair was a capacious one, and was usually well lighted; on this occasion, however, it happened to be dark. There was no one outside the door when he entered, and he heard the door shut itself immediately after him. In groping his way to find the first step of the stair, what was his astonishment to behold, without the noise of the door opening, one or two individuals enter, the one after the other. They seemed to come up within a few yards of him, and were soon followed by others; more and more then crowded in, until the place appeared quite full. They jostled each other, and seemed to vie with this gentleman which would get soonest up stairs. He felt, he said, the feeling as if he was carried away in a crowd, but at the same time did not feel any one touch him; he looked right and left, before and behind, and the place was crowded. There were men, women, and children, with all kinds, colour, and variety of dress, with hats and without them. One young lady in particular, who had got in advance of him, often looked back in the crowd; he could not say that he recognised her, or that he had ever seen her before. Various of the individuals comprising this crowd seemed to speak to each other and to laugh, but no sound was audible. He by and by reached his patient's door, at which the servant was with a lighted candle, and which at once dispelled his numerous companions.

3. A very similar case was related to me by a professional friend in the country. It occurred to him many years ago, and I detail it here, as it seems to have arisen from the same cause as produced them in the case of my friend, whose curious illusions I have now detailed.

This gentleman, Mr G., was at the time resident in Ireland, whence he had been suddenly summoned to Strasburg. He had a parting glass or two with a friend, with whom he had some business before starting. He stayed rather long with his friend, and in his hurry to get along in time to meet the coach as it passed a particular portion of the road, he unfortunately fell over a heap of stones, and severely contused and injured his hand. The feverish state into which he was thrown with it, and the want of sleep which he experienced in constant travelling for three nights and days, was doubtless the means of producing the following painful illusion. He was sitting beside the driver of the mail on the third night after he met with his accident, and during which time he had almost no sleep. As night came on, they were driving along a bleak level road, without anything to interest the passenger; his mind probably wandered to the home he had left, and to his relations and friends in Scotland. He had not been long wrapped in contemplation, ere he observed the road before him assume an undulating motion like the waves of the sea. Bright red objects seemed to occupy positions on the horses' backs; soon these red objects were gathered together into two fiendish-looking shapes, dressed in red, which occupied the leaders' backs; they stared at him grimly, and continued for a time there. After rubbing his eyes and making a strong effort to off shake the vision, these two red objects became gradually fainter and whiter, and at last assumed the form of a cousin of his who was married in Scotland. This figure seemed to gaze at him with a mournful and thoughtful expression of countenance for a time, while he recognized every feature as distinctly as if she had been in reality before him. The scene, however, was soon again changed; for the image becoming fainter and fainter, soon assumed the form of two of her children dressed in shrouds, which lay over the backs of the respective horses. The whip cracked, the driver urged his cattle; still they were there; my friend rubbed his eyes and attempted to shake off his listlessness, but the figures were still present; and at last a feeling of exhaustion, of horror, and general illness came over him, so insupportable that he stopped the coach and got inside, where he was not long ere he fell into a profound sleep, which dissipated all his imaginary terrors. He awoke next morning a new man; having slept long and profoundly, he reached Strasburg, and having transacted his business there, soon afterwards returned to Ireland. The first intelligence he received upon reaching home was the death of his cousin's two children; one of disease, the other by an accident; they did not die at the same time. The coincidence, as he himself terms it, has often since struck him as a curious one, the apparition having been produced, as in the previous instance, by fatigue, want of sleep, and exhaustion, and the peculiar forms it assumed by the train of thought which had occupied his contemplative moments before the apparition appeared.

4. Another case which I have to mention is a very remarkable one; and had the person to whom they occurred had the slightest idea of spectral illusions,—had he been aware that such an explanation of phantasmata existed,—I should not have put the same credence in his illusions. The account of them was wrung from him bit by bit, and with difficulty, he fearing all the time that he would be put down as insane. After explaining to him, however, that such phenomena were frequently witnessed by people during various derangements of bodily health, he was induced to give me a somewhat detailed account of the apparitions he had witnessed.

On several occasions he even saw the figures when I was present, and pointed out the spot which they occupied. It may be stated, that this gentleman, whom we shall call Mr Z., has been for many years in the habit of taking constantly, and often indulging rather freely in the use of spirituous liquors, without, however, materially deranging his health. On the first occasion of my seeing him professionally, he laboured under a small ulcer of the leg. It was tedious in healing, and he was placed on very restricted allowance and spare diet. No symptom whatever of delirium tremens made its appearance; he had no tremors; never was the least feverish; slept, and took his food well. This was the first occasion of his seeing apparitions. While lying in bed various figures used to appear before him, to pass before the bed, and sometimes to stand still and gaze at him. They at last began to address him, and he spoke freely to several familiar faces that he recognized amongst them. About this time, his friends consulted me regarding these conversations which they said he carried on with himself, fearing that his mind was giving way; when, upon questioning him more particularly, and explaining matters, he related to me the above particulars, from which I was enabled to calm the fears of his relatives regarding his sanity. On the next occasion of his requiring my professional assistance, he had been suffering from influenza for some weeks. When I saw him, he laboured under an attack of acute bronchitis, with considerable amount of fever, and deranged digestive organs. He was blistered on the chest, put under antimonial medicine and spare diet, under which he gradually improved. On this as on the former occasion, he never suffered from the abstraction of the stimuli. He did not sleep well at first, chiefly in consequence of the harassing cough; but as the severity of the symptoms abated, he slept well, had no tremors, and took food. It was about a fortnight after my seeing him on this occasion, and when the febrile symptoms had completely subsided, that he first made me aware of his illusions. His old friends returned and visited him, at his bedside, held long conversations with him, laughed and were merry together. Mr Z. being weak, and having some irritability of bladder requiring him to rise frequently, he was often assisted, as he said, and much supported by his spectral visitors.

A considerable variety of persons had in this way visited him; persons long dead, many children, but especially his friends and acquaintances. They appeared too, when other individuals were in the room along with him. His brother told me that he has often been witness to his carrying on long conversations with some creature of his imagination, while he was sitting in the room beside him. The variety of his daily visitors at last dwindled down to two; but these two remained with him for three or four successive days and nights. They were always present for that period of time, and occupied nearly the same position in the room; the two individuals consisted of a male and female. The male was dressed after the fashion of the last century, and wearing a black velvet cloak. He had a wider range than his companion; he seemed to have the power of moving up and down to a considerable extent. The female figure was also dressed in black, but more after the fashion of the present day, with a modest and retiring countenance. She occupied almost constantly the same position in the apartment. She seemed to have considerable influence over her male companion, as when Mr Z. expressed a wish for anything, she seemed always to be consulted before it was granted. The man was, according to the account, most assiduous and attentive, nay, he even sometimes anticipated Mr Z.'s wishes. He always assisted him in getting out and in to bed, and performed for him various personal duties. They conversed together for lengthened periods, and often told him stories of olden times, which made him laugh heartily. The female never spoke, and was most delicate and polite in her behaviour. I have been present on various occasions when these visitors were also there. Their locality was pointed out to me, the direction in which they were looking, as well as the character of their countenances at the time. I never, however, witnessed any of their conversations. Mr Z. often expressed himself astonished that objects that had been so long beside him, and were so distinct to his perception, could not be seen by me.

These individuals disappeared in due course, and a peculiarly antique and curious old table occupied the position in the room in which they had formerly performed. This table existed only in his imagination; for he assured me that on several occasions he has rung the bell to have it removed, and had to get up out of bed as often to ascertain if it was a reality. His brother, too, told me that he has pointed out to him the various parts of that table with as much minuteness as if an antique piece of furniture had been before him.

5. Professor Alison has been kind enough to relate to me the following case, in which the organ of hearing alone was affected.

"The lady was from the north of England, middle-aged, and subject to various nervous complaints, partly referable to family misfortunes. She had headaches, was often restless at night, and once or twice, while I was attending her, had spectral illusions impressed on the sense of sight; but the peculiarity of the case was the very frequent impressions on the sense of hearing, which she always described as human voices, speaking in general quite articulately, but only a few words at a time. She always said that she recognized several voices, all of which she heard on many occasions; but she was most affected by hearing occasionally the voice of a child, a niece of her own, to whom she had been much attached, and who had died some time previously.

"She described the voices as heard behind her, or to one side, —I think never in front of her,—on some days, particularly after restless nights, or when her health was somewhat disordered, much more than on others. On some days, wherever she went,—to pay visits, to church, or even on a long journey,—she was, as she expressed it, *attended* by the voices.

"I had no reason whatever to doubt her description of her feelings. She seemed to be a sensible and amiable woman. She had no wish to make a display of her peculiar symptoms, described them to her friends just as she did to me, and seemed always much gratified when she could say that they had abated. She always said that she knew they were merely imaginary; yet, in her usual way of describing what she felt, she spoke of her sensations as if caused by real existence, and always said they were quite as distinct to her as the sounds of real human voices. I repeatedly asked her whether she thought she had ever acquired information about real events, by means of these voices, and she used to say that she really thought she had; but she did not express herself confidently on that point, and could not mention any examples excepting one or two, which seemed manifestly fallacious. In general, I think she said that the words which seemed to be spoken were only reminiscences of past events, or texts of scripture, or sometimes directions to her as to matters of little importance.

"The affection had abated somewhat, but still existed when I saw her last, which was some months after I had first seen her."

6. Dr Simpson has been kind enough to communicate to me the history of the illusions of a delicate, intellectual, and supersensitive lady whom he has attended in two confinements. She was brought to town again in bad health, with occasional faintings. "She told me," says he, "that she was afraid her mind was breaking down; and, on further questioning her on this point, it turned out that she had been seeing spectral illusions for some time, and that the sight of these had produced the faintings and fears under which she had been suffering. For some time she has *found* the furniture occasionally in different positions from what she *saw* it; no tables where she saw them, and chairs in positions where she did not expect them. Her father died about fifteen months ago. About two months after his death she was lying in bed one summer morning, thinking of her deceased parent, when to her consternation she saw him walk into the room and seat himself in a chair which he sometimes occupied. A short time ago, my patient, at the breakfast table, recommended to her mother a book which she had been reading, and that had highly delighted her. When sitting in her own room during the forenoon, her mother walked in, and proceeded to the table where some books usually lay, as if in search of the volume

talked of. My patient immediately stated that she had left the book in the library down stairs, but would go down for it. She thought it odd that her mother did not answer her, but ran down into the library for the desired volume. On entering it she fainted, for to her horror she saw her mother sitting there busy perusing the work in question, the visitant to her own room above having only been a spectral illusion."

7. A medical friend has had the goodness to communicate to me the particulars of a series of spectral illusions which occurred to him while labouring under the effects of general plethora, with determination of blood to the vessels of the brain. He was cupped, &c., and actively treated, and it was during his convalescence from the disease, and from the effects of depleting remedies that he saw the following spectral illusions.

"I was not a little surprised one forenoon, while busily musing on the probable *pathology* of my own and similar cases, on perceiving an extremely minute yet *very distinct spectral illusion*, which for life-like reality could not, I then imagined, be surpassed.

"The bed-curtains were partially drawn, and the light from the windows at the time unusually excluded, conditions which probably rendered the spectral phenomena I then observed peculiarly attractive.

"From a somewhat obscure back-ground I first noticed a ray of light slowly to emerge, and, while advancing towards me, gradually to unfold itself as it were into a living, active, and altogether grotesque epitome of humanity, so extremely minute, and yet so complete in form, colour, and expression, that I was most agreeably astonished at the very *distinctness* of the novel and ludicrous illusion, more especially when it reached its complete development, which it seemed to do when it approached to within an arm's length of me, when it suddenly disappeared, but only to make way for another and equally comic figure, which also seemed to spring forth on the unfolding of the light that again appeared slowly advancing from the dark back-ground already referred to. So long as my vision and attention were directed to this phantasmagoric scene, a long succession of these *Liliputian comedians* continued in like manner to appear, and to give the most amusing and apparently never-ending variety of character and action to the pantomime which the pigmies one by one enacted.

"For some time I continued to watch with intense interest the individual origin, growth, and dissolution of my tiny and short-lived visitors, and endeavoured, as one vanished, to anticipate the particular appearance which its successor would assume; but generally failed in the experiment, as each succeeding illusion presented, either in its figure, expression, or colour, something quite novel and characteristic.

"So soon as my particular attention was withdrawn from the imaginary *camera obscura* (*the dark back-ground*), the exhibition, for the time being, ceased; and it was not till the following day when, under the same circumstances, I again discovered more of my airy performers, with the strange antics of whom I again wiled away what might otherwise have been to me a tedious or lost hour.

"Their presence, when thus solicited, continued for several subsequent days, after which, however, I could no longer perceive the slightest trace of their existence, the *obscure back-ground* from which their matrix (*the evolving ray*) used to emerge, having now also become altogether dissipated.

"I rapidly thereafter regained my former health, and have since then, I am happy to add, remained a perfect stranger to *headaches and spectral illusions.*"

SECOND CLASS.—APPARITIONS HAVING THEIR ORIGIN ENTIRELY IN EXTERNAL CIRCUMSTANCES.

We now come to the *second* division of the subject, viz., to those apparitions the result entirely of external circumstances. I have already remarked that during twilight external objects lose their distinctness of outline, and become dimmer to the sight, and are, under these circumstances, more easily passed over by an individual wrapped in contemplation. In darkness and solitude it becomes still more marked.

The peculiar arrangement of light and shade which, under certain circumstances, is produced by the sun's rays, and more especially by the rays of the setting sun, by the moonbeams, by the decaying embers of a flickering fire, or by the uncertain light of a dying night taper, have all had their share in producing phenomena of this class. Superstitious dread, or a certain degree of mental excitement, add materially to the effect of phenomena of this kind.

It would seem that, like those instances having their origin in the mind alone, a certain amount of excitement of the imagination, or fear, is necessary to the production of this class of phenomena. The well-known illusion which occurred to Sir W. Scott, in coming out of his library into the hall at Abbotsford, is worthy of notice.

It was in the darkening twilight of an autumn evening, he had been reading an account of his recently-deceased friend and fellow poet, Lord Byron, and his mind had been to a certain degree excited by the details of Lord Byron's last hours and untimely death. When he had reached a certain portion of the hall, on turning his eyes to a screen on which usually hung a series of cloaks, hats, &c., he recognized the exact representation of his departed friend; he stopped for a single moment so as to notice the wonderful accuracy with which fancy had impressed upon the bodily eye the peculiarities of dress and posture of the illustrious poet. Sir W. went up to the screen, and found that the image had been produced on his excited fancy by the moonbeams falling on a peculiar arrangement of cloaks, hats, &c., as they are usually seen in a country entrance hall.

Mr H., whose illusions I have formerly related, has given a very marked case of this class. "One evening, towards dusk, whilst sitting in the garden he rose suddenly and experienced a feeling of slight giddiness." As it went off, he beheld the figure of a man with a large blue cloak thrown around him, and standing under a tree at a short distance. While Mr H. stood gazing at it, it continued for a minute or two, gradually became more faint in outline and colour, and then disappeared. It appeared again under the same tree shortly afterwards, when Mr H. walking up to it, it gradually as it were receded, and disappeared as it cleared the shadow of the tree. There can be no doubt but that it was produced by this shadow acting upon an excited mind under some peculiarity of bodily indisposition.

A very striking instance of this kind occurred some time ago to myself. I was called hurriedly out of bed, on a summer night, to a patient who was said to have committed suicide. I reached the house in time to see her expire; she had divided the trachea and large vessels of the neck, the profuse hemorrhage from which had so alarmed her relations, that they all fled from the house. I found her lying huddled up on a door-mat, on which she had fallen in passing from one room to the other, and on which she expired. She was a respectable, young, and good-looking woman, and her history was a most melancholy one. The details of her melancholy end were brought before my mind again and again for several weeks, in consequence of my being concerned in arranging matters with the friends. Many months afterwards, I was called again professionally to the same house. It was evening, and the moon was shining brightly as I ascended the stairs; the door of the house was open, and, to my astonishment, the first thing that my eyes encountered was the door-mat, with its dying burden as bright and distinct as when I first beheld it. I was much struck with the circumstance, and paused for a time to observe with what accuracy fancy and the effects of the moonbeams had brought back a recurrence of the painful associations connected with my former visit. Upon reaching it, I discovered that it was merely a shawl or some clothes that had been accidentally dropped on the door mat. It is impossible to describe with what accuracy of colour, outline, and form this painful image was brought back; nor was it the result of my mind having recurred to the subject in approaching the house; at all events, of this I was not aware, and felt much struck when I suddenly beheld the form as I had previously so painfully witnessed it extended on the door-mat. Nor could I see it again as I descended the stair, although the same drapery was there, and the moonbeams fell as before. The spell, in fact, was broken. Imagination had no longer its full play; and although I looked at it again and again, I could make nothing out of it but mat, drapery, and moonshine.

Dr Ferriar of Manchester has related a very interesting case of this kind. "A gentleman was benighted while travelling alone in a remote part of the Highlands of Scotland, and was compelled to ask for shelter for the evening at a small lonely hut. When he was conducted to his bedroom, the landlady observed, with mysterious reluctance, that he would find the window very insecure. On examination, part of the wall appeared to have been broken down to enlarge the opening. After some inquiry, he was told that a pedlar who had lodged in the room a short time before had committed suicide, and was found hanging behind the door in the morning. According to the superstition of the country, it was deemed improper to remove the body through the door of the house, and to carry it through the window was impossible without removing part of the wall. Some hints were dropped that the room had been subsequently haunted by the poor man's spirit. The gentleman laid his arms, properly prepared against intrusion of any kind, by the bedside, and retired to rest, not without some degree of apprehension. He was visited in a dream by a frightful apparition, and awakening in agony, found himself sitting up in bed with a pistol grasped in his right hand. On casting a fearful glance round the room, he descried by the moonlight, a corpse dressed in a shroud, reared erect against the wall close by the window. With much difficulty he summoned up resolution to approach the dismal object, the features of which, and the minutest parts of its funeral apparel, he perceived distinctly. He passed one hand over it,—felt nothing,—and staggered back to the bed. After a long interval, and much reasoning with himself, he renewed his investigations, and at length discovered that the object of his terror was produced by the moonbeams forming a long bright image through the broken window, on which his fancy, impressed by his dream, had pictured with mischievous accuracy, the lineaments of a body prepared for interment. Powerful associations of terror in this instance had excited the recollected images with uncommon force and effect."

Another striking instance of the kind is mentioned by Dr Abercrombie. Two esteemed friends of his, while travelling in the Highlands, had occasion to sleep in separate beds in one apartment. One of them having awakened in the night, saw by the moonlight a skeleton hanging from the head of his friend's bed, every part of it being perceived in the most distinct manner. He instantly got up to investigate the source of the illusion, and found it to be produced by the moonbeams falling upon the drapery of the bed, which had been thrown back in some unusual manner, on account of the heat of the weather. He returned to bed and soon fell asleep; but having awoke again some time after, the skeleton was still so distinctly before him, that he could not sleep without again getting up to trace the origin of the phantom. Determined not to be disturbed a third time, he now brought down the curtain into its usual state, and the skeleton appeared no more.

APPARITIONS HAVING THEIR ORIGIN IN THE OBSERVATION OF ELECTRICAL PHENOMENA OR PHOSPHORESCENT EMANATIONS.

Another important source of apparitions is to be found in that power, which some possess, of clear seeing, or perceiving minute gradations of light and shade, which are altogether beyond the perceptions of the bulk of mankind. This faculty of seeing luminous appearances would seem to rest in individuals of a highly nervous temperament, and whose organs of sense become preternaturally acute during twilight and darkness. Thus it is recorded* of a little girl in humble life, called Mary Delves, of a highly nervous temperament, who used frequently to say that the cat was on fire, and that she saw flames issuing from various persons and objects.

Professor Simpson has with much kindness communicated to me the case of an extremely delicate and highly-susceptible lady, who sees almost constantly, and especially during periods of excitement, a peculiar bluish tinged light emanating from the hands and feet of certain individuals. Her feelings towards individuals seem to be regulated by this appearance; as she states that those who present it, immediately become favourites with her, while she cannot conquer a dislike which she takes to those who have it not.

It must be electrical light of which such individuals become witnesses. We know that such phenomena are constantly going forward, and most people can distinguish it in the dark, from stroking the backs of certain cats; and it is most probably to the same natural process that we are to refer the power which certain individuals, while labouring under various nervous diseases, possess, of seeing lights from magnets and certain kinds of crystals. It remains yet to be explained, however, why I should class this power amongst the sources of apparitions. I confess I cannot adduce any examples of it, but I think it highly probable that such may occur, and be converted by such individuals into objects of superstitious fear.

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* Night side of Nature, by Catharine Crowe.

Sensitive persons, of the kind we have just mentioned, would seem to become cognizant of the phenomenon of phosphorescent emanations more readily than others. Most people are familiar with the peculiar luminous appearance which is given out in the dark by fish of all kinds in a state of decay; and I have no doubt but that some arrangement of this kind has been often had recourse to by the crafty, to produce appearances to the taste or to the consternation of the superstitious beholder. There is, however, an appearance connected with the exhalation of phosphorescence, from the decay of animal matter, to which none but the most nervous and sensitive are cognizant. In Dr Gregory's translation of Reichenbach on Animal Magnetism,* we find the following singular case of this faculty.

"A singular circumstance, which took place at Colmar, in the garden of the poet Pfeffel, has been made generally known by various writings. The following are the essential facts:—The poet being blind, had employed a young clergyman of the evangelical church as amanuensis. Pfeffel, when he walked, was supported and led by this young man, whose name was Billing. As they walked in the garden, at some distance from the town, Pfeffel observed that, as often as they passed over a particular spot, the arm of Billing trembled, and he betrayed uneasiness. On being asked, the young man reluctantly confessed that, as often as he passed over that spot, certain feelings attacked him which he could not control, and which he knew well, as he always experienced the same in passing over any place where human corpses lay buried. He added, that at night, when he came near such places, he saw supernatural appearances. Pfeffel, with the view of curing the youth of what he looked on as a fancy, went that night with him to the garden. As they approached the spot in the dark, Billing perceived a feeble light, and when still nearer, he saw a luminous ghost-like form floating over the spot. This he described as a female form, with one arm laid across the body, the other hanging down, floating in the upright posture, but tranquil, the feet only a handbreadth or two from the soil. Pfeffel went alone, as the young man declined to follow him, up to the place where the figure was said to be, and struck about in all directions with his stick, besides running through the place of the figure, but the ghost was not more affected than a flame would have been. The luminous form, according to Billing, always returned to its original position after these experiments. Many things were tried during several months, and numerous companies of people were brought to the spot, but the matter remained the same; and the ghost-seer adhered to his serious assertion, and to the opinion founded on it—that some individual lay buried there. At last, Pfeffel had the place dug up. At a considerable depth was found a firm layer of lime (white), of the length and breadth of a grave, of considerable thickness; and when this had been broken into, there were found the bones of a human being. It was evident that some one had been buried in the place, and covered with a thick layer of lime (quicklime), as is generally done in times of pestilence, of earthquakes, and other similar events. The bones were removed, the pit filled up, the lime mixed and scattered abroad, and the surface again made smooth. When Billing was now brought back to the place, the phenomena did not return, and the nocturnal spirit had for ever disappeared.

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* Abstract of "Researches on Magnetism, and on certain allied subjects," by Baron Von Reichenbach, translated and abridged by William Gregory, M.D., &c. Edinb. 1846.

"It is hardly necessary to point out to the reader what view the author takes of this story, which excited much attention in Germany, because it came from the most truthful man alive, and theologians and psychologists gave to it sundry terrific meanings. It obviously falls under the province of chemical action, and thus meets with a simple and clear explanation from natural and physical causes. A corpse is a field for abundant chemical changes—decompositions, fermentation, putrefaction, gasification, and general play of affinities. A stratum of quicklime in a narrow pit unites its powerful affinities to those of the organic matters, and gives rise to a long continued working of the whole. Rain water filters through, and contributes to the action; the lime on the outside of the mass first falls to a fine powder, and afterwards, with more water, forms lumps, which are very slowly penetrated by the air. Slaked lime prepared for building, but not used, on account of some connection with a warlike state of society some centuries since, has been found in subterraneous holes or pits in the ruins of old castles; and the mass, except on the outside, was so unaltered, that it has been used for modern buildings. It is evident, therefore, that in such circumstances there must be a very slow and long continued chemical action, partly owing to the slow penetration of the mass of lime by the external carbonic acid, partly to the change going on, as the remains of animal matter, at all events as long as any is left. In the above case this must have gone on in Pfeffel's garden; and as we know that chemical action is invariably associated with light, visible to the sensitive, this must have been the origin of the luminous appearance, which again must have continued until the mutual affinities of the organic remains, the lime, the air, and water, had finally come to a state of chemical rest or equilibrium." As soon, therefore, as a sensitive person comes within the sphere of the force in action, he either feels or sees, according as circumstances favour; and Reichenbach, the author, wishing to strike a blow at the monster superstition, was induced to try the experiment of bringing a highly sensitive person by night to a churchyard. "Mademoiselle Reichel, on two very dark nights, allowed herself to be taken from the Castle of Rusenberg, where she was living with the author's family, to the neighbouring churchyard of Grünzing. The result justified his anticipations in the most beautiful manner. She very soon saw a light, and observed on one of the graves along its length a delicate breathing flame; she also saw the same thing, only weaker, on a second grave. But she saw neither witches nor ghosts; she described the fiery appearance as a shining vapour, one or two spans high, extending as far as the grave, and floating near its surface. Some time afterwards, she was taken to two large cemeteries near Vienna, where several burials occur daily, and graves lie about by thousands. Here she saw numerous graves provided with similar lights. Wherever she looked she saw luminous masses scattered about. But this appearance was most vivid over the newest graves, while in the oldest it could not be perceived. She described the appearance less as a clear flame than as a dense vapour or mass of fire, intermediate between fog and flame. On many graves this flame was four feet high, so that when she stood on them it surrounded her up to the neck. If she thrust her hand into it, it was like putting it into a dense fiery cloud. She betrayed no uneasiness, because she had all her life been accustomed to such emanations, and had seen the same, in the author's experiments, often produced by natural causes."

I am indebted to Dr Wood for reminding me of a case which occurred in this country about eighteen or twenty years ago, and in which the observation of the lambent phosphorescent flame, which I have been describing, was the means of discovering the spot where the dead body of a murdered man had been buried, and of bringing the murderer to justice. An old man of the name of Millie, who resided in the neighbourhood of Cupar (Fife), had been long famous as a weaver, more especially of tablecloths, and had amassed a considerable sum of money by means of his frugality and industry. He had had as his apprentice for some time, a young man of rather dissipated habits.

Suddenly the old man disappeared, and the apprentice left word with the neighbours that his master had gone to Perth, and would not return for some weeks. He left also for Edinburgh. One evening, ten days or a fortnight afterwards, as a neighbouring clergyman was riding home slowly in the dark, he happened to look over the wall which enclosed the patch of ground which Millie used as a garden. He then became sensible of a phosphorescent light near the foot of the garden, of considerable extent. Upon pointing this out to a companion who was with him, he could see nothing; but so impressed was the clergyman with the appearance he had seen, and probably dreading something from the sudden manner in which Millie had disappeared that he communicated what he had seen to the proper authorities, who immediately ordered an investigation to be set on foot, and the garden to be dug, more especially about the spot where the luminous appearance had been seen. Along the gravel walk, a few feet from the wall, at the bottom of the garden, and only covered with about six inches of soil, lay the body of Millie, with his skull beat in from behind. The apprentice was soon discovered, tried, and condemned, and made a full confession of his crime before death. I have not been able to get a particular account of the appearance of the light observed by the clergyman in Millie's garden. A lady, however, who remembers the particulars minutely, mentioned to me, that she had heard it always described as a white smoke rising, as it were, from the place where the body was buried.

It will at once appear obvious why I place the previous facts under the head of those likely to produce spectral phenomena. I have already mentioned one instance from Reichenbach, where it did give rise to this idea in the mind of an imaginative individual, most probably impressed with superstitious belief. There would seem to be considerable variety in the appearances which have been noticed by those who have the power of seeing phenomena of this nature. Sometimes it has been noticed as a flickering sheet of light; sometimes as a steady lambent flame; at other times a sheet of white smoke about four feet high; and in the instance of Pfeffel's amanuensis, it would seem to have risen to the height of five or six feet, in the shape of an upright column, so as to put on the form of a female figure. In this latter instance, the height to which it rose, and the apparent density of the lambent column, in all likelihood arose from the proximity of the lime, and which has the effect of causing a greater quantity and longer continuance of the evolution of phosphoric gases from animal matters. The height, density, and brightness of the others seem to have borne a proportion with the length of time that the animal substance had been interred. To the privileged eye of an individual who possesses this faculty, there is no end to the images of form and beauty which a lively imagination might conjure up out of phenomena of this class.

I have no doubt that this has been the origin of the numerous class of churchyard ghosts, wraiths, and spectral lights; and when the mind is sunk in superstitious belief, it is not to be wondered at, that such appearances were referred to the spirits of the dead hovering over the earthly tabernacle. A rational exposition, however, of the causes and appearances produced by the gases evolved during decomposition may go far to dissipate a lingering tendency to supernatural belief. The numerous ballad romances, or the horrors of a churchyard by night, will then be forgotten, unless as matters of history, and placed with a phenomenon of a similar class—the ignis fatuus, or "Will of the Wisp," which was at one time referred to a set of mischievous demons, inhabiting bogs and fens, flickering here and re-appearing there, and misleading the unfortunate traveller from the proper path till he was swallowed up in the bog. Such appearances, too, instead of being popularly looked upon with the awe they were wont to be, only represent to the mind of most people the lighting up, by electricity or otherwise, of the gases evolved from the swamp, and are regarded as examples of the curious workings of the chemistry of nature.

It might be well here, if possible, to determine a point which in some cases might be somewhat difficult, but nevertheless of vital importance to the interests of others, and that is, How are we to distinguish between spectral illusions the result of functional derangement and those arising from disease?—in fact, where is the line of demarcation to be drawn? We know that a spectral illusion is often the first symptom of an attack of delirium tremens, epilepsy, or mania; and it may become a matter of nice medico-legal investigation to distinguish illusions of the one from those which result from functional derangement.

I believe the one class of cases may in general be distinguished from the other by the mind becoming conscious of the illusory nature of these apparitions in the one, and considering them realities in the other. In the one, it is only functional derangement which gives rise to the illusions, and the individual is able to correct the illusions of the one sense by the others; while in those the result of disease, a morbid train of mental phenomena affect all the senses, and prevent the one from correcting the impressions of the others. The case of Mr N., which has been related by Dr Craig of Ratho, and commented upon by Dr Craigie of Edinburgh, illustrates well this distinction. Mr N.

was liable for twelve years to see these spectral visitations, "yet during the whole period, nay, even to the last, was quite conscious that they were illusions, and showed that his judgment was perfectly correct throughout the whole period."*

The apparitions connected with functional derangement are sometimes so distinct in colour and outline as to be mistaken for realities; and it often becomes of importance for individuals who are the subject of spectral visitations, to distinguish between a phantasm of this kind and a real object.

Dr Brewster proposed a very beautiful test, founded on the laws of optics. He says, it is easy to distinguish an object existing externally "from one created by the mind, by merely pressing our eye, or straining them both so as to see objects double; for in this case, the external object, or supposed apparition, would invariably be doubled, while the impression on the retina created by the mind would remain single." Another very beautiful test has been mentioned to me by Professor Simpson, as the discovery of a lady of his acquaintance who is in the habit of seeing spectral appearances. When a figure appears before her, and about the reality of which she is not quite certain, she has only to look towards the mirror to decide the question. I have previously explained that spectral appearances follow the axis of the eye-ball; so that, in looking at an apparition having its origin in the mind, it seems to move away, and the eye is supposed to be following it, while, in reality, it is the reverse—it is the eye which moves, the mental apparition keeping in the axis of it. So with this lady; she follows it until her eye reaches a mirror; she then looks at the apparition and its image in the mirror. If the figure has its face turned towards her when she looks at it, it ought to have its back to the mirror, if reality; but if an apparition or mental process, it has both its face to her and also to the mirror. In this scientific way has this lady brought herself to distinguish phantoms of her imagination from realities. Another and more simple plan still would be, to turn to the opposite part of the room from which the apparition has been first noticed; if a real object, it could not have the power of such rapid locomotion; but if an apparition or mental process, it would be at the opposite side of the room as quickly as the eye could rest there.

APPARITIONS HAVING THEIR ORIGIN IN VARIOUS STIMULATING, NARCOTIC, AND OTHER SUBSTANCES INTRODUCED INTO THE BLOOD.

It may be considered that this class of spectral phenomena should be placed amongst those which have their origin in the mind alone. I prefer, however, placing them here as a fourth and last source of apparitions. In mentioning the different substances which are liable to produce, or render the senses susceptible to the production of, spectral forms, I shall first speak of those of a stimulating nature; secondly, of those of a narcotic and narcotico-acrid kind; and, lastly, those arising from other substances, of which some of the compounds of sulphur and of carbon form examples.

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* Edin. Med. and Surg. Journal, No. 129.

The physiological manner in which these substances act in the production of images may be shortly referred to. Experiments abundantly prove that all of them act by being first absorbed into the blood; and secondarily, by their action on the heart and blood-vessels, and brain itself. In individuals who die from the action of these poisons, the vessels of the brain are always found in a state of congestion; but whether this is the cause of the extinction of the nervous energy, or the depression of this energy is the cause of the congestion, it is impossible to prove. A variety of circumstances would lead to the conclusion, that after the absorption of the poison into the blood, it next acts by increasing the action of the heart and vessels, and then causing an increased quantity of blood to circulate in the vessels of the brain. As the action proceeds, nervous energy is paralyzed, and congestion in the vessels of the head takes place.

The same action seems to be produced by these substances in whatever manner they are introduced into the system. Experimental researches, and accidental poisonings with these substances in recent times, have thrown much light on the peculiar symptoms produced. They were much used by the ancients, and some savage nations at the present day use them habitually, both alone and combined, for various purposes, and often for the simple pleasurable visionary appearances which occur during the temporary intoxication produced. They were used in various ways. They were given internally in the form of potions or boluses; the smoke of them was inhaled in close apartments; or the body was anointed with them, or rubbed with decoctions of them. The aspirants to initiation, and those who expected to behold prophetic visions of the gods, were prepared by a fast more or less prolonged; after which they partook of meals expressly prepared, and also of mysterious drinks, such as the water of Lethe.* They have been often mixed with wine and stimulating liquids, and even with food, for the purpose of being secretly administered. The Portuguese women, especially of Goa, mix the juice of the seeds of plants of this kind for the purpose of throwing their husbands into a state of stupor for many hours; and the men, says "Pyrard," make use of the same secret in order to submit to their desires women who would consent by no other means. Buchanan, the Scottish historian, states that the victory of Macbeth over the Danes was obtained chiefly by mixing the juice of the *Atropa Belladonna* with wine, which was sent as a donation to Sweno during a truce. The action of these substances in the form of smoke, or the odour of them when burnt, would seem to have been much more studied by ancient Thaumaturgists, than by philosophers and chemists of the present day. Herodotus informs us that the Scythians became intoxicated by inhaling the vapour arising from the seeds of a species of hemp; and it is stated of the seeds of the datura that similar effects are produced. Tobacco, too, in the form of smoke, in many individuals, has the power of producing visionary appearances; and it is stated that the effect of inhaling the vapours of the seeds of henbane, is to produce a tendency to anger and quarrelling. The instance of a man and wife is mentioned who were continually quarrelling, and this tendency was traced to the vapour of the seeds of henbane—quantities of which were found near the stove. All tendency to quarrelling vanished when they were removed. In the Dictionnaire de Medecin, Tom. vii., and l'Encyclopedie Methodique, there are other examples of the same effects. M. Salverte remarks that "this class of agents was so much the more valuable to the Thaumaturgist, that it not only eludes the eye, but it does not even affect the olfactory nerves in proportion to the violence of its effects." Many individuals who use stramonium for smoking as a medicinal agent, become so enamoured with its effects, that they continue to indulge in its use, after the necessity for it is gone. I have at present under my care an individual who describes it to produce first dryness of throat, then slight giddiness, and afterwards delightful sensations, and sometimes pleasing visions.

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* Eusebe Salverte on the Occult Sciences, Vol. ii. page 2.

The effects of opium-smoking are not to be seen in Europe. In numerous countries of the East, however, it is a favourite practice. Marsden and Dr Pereira have given most minute and instructive accounts of the practice. The smokeable extract is made into pills about the size of a pea; these are put into the opium-pipe. The tube into which they are placed is then applied to a lamp, and the pill being lighted, is consumed at one inhalation. The smoke of it is all drawn into the lungs, and is attended with a peculiar whistling noise; it is then emitted by the nose or ears, seldom by the mouth again. The first effect is to render them more loquacious and animated; laughter succeeds, vacancy of countenance, paleness, vertigo, and deep sleep. Sometimes they are said to be thrown into a state of complete happiness, and to have most beatific visions. "The Malays are rendered outrageous and quarrelsome by the opium-pipe."

It was anciently a custom with most nations, and especially those of eastern climes, to anoint themselves with oil.* This custom, originally introduced from necessity in regions exposed so much to the scorching heat of the sun,† and when the customs and exercises often required the supposed use of it, became by and by a matter of luxury and necessity. Soon, however, not content with simple oleaginous substances, they added various kinds of perfumes and aromatic spices. Virgil has described Turnus as having his hairs moist with myrrh; nor did Telemachus and Pisistratus, with all their wisdom, scruple to have all their bodies rubbed with perfumed oil after visiting the palace of Menelaus, and before they sat down to eat. It was the custom among the Jews to present every man with perfumed oil to anoint his head with. Many illustrations of this are to be found in Scripture history. Thus, amongst others, when the Pharisee with whom our Saviour ate, was offended because a woman should be allowed to anoint his feet, he said, "Mine head with oil thou didst not anoint; but this woman hath anointed my feet with ointment."

The process of introducing medicinal substances into the system by means of external inunction must have been early tested experimentally. The use of oil and other perfumed oleaginous substances was so common that no difficulty could have been experienced in putting into such a mixture a substance which, when absorbed into the blood, would have certain effects. We consequently have abundance of evidence to show that the physicians often prescribed inunctions with liniments which must have been medicated. The characters of physician and priest were often combined—at all events, when they were separate, what was known to the one was not likely long to remain a secret from the other. In the romance of Achilles Tatius, an Egyptian doctor, in order to cure Leucippus of an attack of frenzy, applied to his head a liniment which produced sleep shortly after the anointing. Before consulting the oracle of Trophonius, we are told that the body was rubbed with oil, which undoubtedly concurred in producing the desired vision.

Among the mysteries of the Indian sages, M. Salverte informs us that Apollonius and his companions were anointed with oil, the strength of which made them imagine that they were bathed with fire.

The priests of Mexico, preparatory to conversing with their divinity, continues M. Salverte, "anointed their bodies with a fœtid pomatum. The base of it was tobacco and a bruised seed called ololuchqui, the effect of which was to deprive man of his judgment, as that of the tobacco was to benumb his senses." After this they felt themselves intrepid, and predisposed to have visions. Ointments of this kind soon got the name of magical; but it would appear that they produced these effects in causing sleep; and in dreams which followed their use, the individuals supposed themselves carried elsewhere, and that surpassing scenes of majesty and grandeur passed before them. It was after this manner that the sorcerers of old were transported to the *Sabbat;* but before going, they were obliged to rub themselves on the way with pomatum. Porta and Fromaun[*] relate anecdotes of sorcerers set to sleep with the magic ointment, and who declared when they awoke that they had been at the *Sabbat*, and were astonished when assured of the contrary; and a judge of Florence saved the life of a poor wretched sorceress by watching her process of going to the *Sabbat.*[†] After being rubbed with fœtid drugs, the pretended sorceress lay down and fell asleep. No pinching, pricking, or blows could awaken her, and next day she declared that she had been at the Sabbat, and detailed the painful sensations she had experienced.

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* "It is well known that the Jewish kings and prophets were admitted to their several offices by unction."—Potter's Archæologia, p. 232.

† A new-born infant in Africa is first smeared all over with cow-dung, then washed with the juice of some particular leaves, and then anointed with the fat of lambs or mutton.

The composition of this magical ointment, although kept a profound secret, Porta[‡] and Cardanus[§] have mentioned to us. They describe two different kinds, of which the Solanum somniferum forms the base of one, while henbane and opium predominate in the other. The learned Gassendi anointed some peasants with a liniment containing opium alone, and found it produce the same effects.[‖] Wyer says that the ointment referred to by Cardanus consisted of the fat of boys mixed with the juice of parsley, aconite, solanum, pentaphyllum, and soot.

These presumed assemblies called the Sabbat had become notorious from the beginning of the fifth century; and in order to explain, says M. Salverte, "the confessions of the multitude of credulous or imbecile persons of both sexes who firmly believed themselves to be sorcerers, and were convinced that they had attended the Sabbat, it is only necessary to connect with the use of the magical ointment, the deep impression on the imagination that had been made by previous descriptions regarding this assembly." There can be no doubt that the liniments and ointments used by the priests, magicians, and sorcerers of old, were much more potent in their effects than those which we know of at the present day. Preparations of opium, belladonna, and hyoscyamus, are in daily use as ointments and liniments without producing similar effects. Probably, however, they were rubbed in more assiduously, in greater quantity, and combined together for a particular purpose, which gave them a more decided action. There can be no doubt, however, that they knew the parts in which absorption occurs most readily, as the palms of the hands and soles of the feet, the armpits, and interior of the thighs.

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[*] J. B. Porta, Magiae Naturalis, and Fromaun, Traité de Fascin: quoted by M. Salverte, lib. xx.

[†] The Sabbat was an imaginary assemblage of sorcerers, magicians, and demons, which was supposed to be frequented by all those who had this power, and they took the forms of birds and various animals to go to and return from it.

[‡] J. B. Porta, Magia Natura, lib. ii.

[§] Cardanus de Subtilitate, lib. xviii.

[‖] Wyerus de prestigiis Daemonum, lib. ii., cap. xxxvi., p. 4.

Stimulating Substances.—Of the substances belonging to this class, alkohol, ether, chloroform, and probably the nitrous oxide gas, may be particularly specified. The peculiar effects which alkohol, ether, or chloroform have in vivifying sensations, have been felt by most. The effects which they produce may be generally stated to be excited vascular action, flushed face, giddiness, confusion of thought, various mental affections, corresponding with the character of the individual, delirium, dozing, profound somnolency. Visions or apparitions during this state, however, are by no means common. Burns has not forgotten to refer to illusions of this kind, in those under the influence of alkoholic potations and superstitious fear—

> " I wasna fou, but just had plenty,
> An' hillocks, stanes, and bushes kent aye
> Frae ghaists and witches."

It is singular how seldom chloroform produces visionary appearances. There is, no doubt, always a certain amount of congestion in the vessels of the head, denoted by prominent and injected eyes, increased pulsation in the arteries of the head, rushing noises in the ears, and derangement of vision, but seldom are there spectral appearances. Dr Simpson informs me that in all his great experience of the use of chloroform, although aural illusions are common, he only recollects one case of an optical nature. "Our friend, Dr —— of Edinburgh, has on several occasions, when inhaling chloroform, seen his wife suddenly appear before him. Some time ago, when smelling a quantity of new chloroform, standing at the counter of the druggist, in order to ascertain its quality, Mrs —— suddenly sprung up behind the counter, and vanished as rapidly as the effects of the chloroform disappeared." I have been informed of an instance, in which a gentleman after examining the figures of stained papers, always after the use of chloroform, beheld similar arabesque figures.

The effects of inhaling the nitrous oxide gas may be also mentioned, as they approximate to the effects produced on the senses by ether and chloroform. Dr Hibbert has given them as "an increased sensibility to touch; visible impressions becoming more illuminated; luminous points arising to dazzle the vision; pleasurable thrillings and sublime emotions; feelings of such delight as almost to destroy consciousness."

Narcotic and Narcotico-acrid poisons.—The poisonous substances of this class, which appear occasionally to give rise to visionary appearances in the process of their peculiar action on the nervous centres, may be enumerated, as opium, tobacco, henbane, solanum (various species), stramonium (various species), belladonna, conium, cicuta, and *cannabis indica.* It would be unnecessary for our purpose to go over the effects which are produced by the different vegetable substances which I have enumerated, and their peculiar active principles. I shall take for example the *datura stramonium,* the *papaver somniferum,* and the *cannabis indica.*

The datura stramonium, or thorn-apple, is an indigenous plant, all parts of which are probably poisonous; the seeds, however, are the most virulent. Dr Pereira has given a most accurate account of the symptoms produced by this drug. It seems to be anæsthetic in its effects, but not anodyne. In considerable doses it produces dryness of throat, thirst, nausea, giddiness, partial dilatation of the pupil, obscurity of vision, nervous agitation, disturbance of the cerebral functions, and delirium passing into mania. In three instances of poisoning with this drug, adduced by Alibert, there was delirium, restlessness, constant incoherent talking, dancing and singing, with fever and flushed face; and in a case described by Dr Traill, about eighteen grains of the extract were taken by accident, and were followed by dryness of throat, giddiness, dilated pupils, flushed face, glancing of the eyes, incoherence resembling intoxication, and incessant incoherent talking like a demented person. Some species of datura would seem to be an important ingredient in the magic electuary used by the Indians for the production of spectral appearances. Dr Tschudi, in his travels in Peru, gives a most interesting account of the effects produced by the *datura sanguinea,* which the natives call huacacahu, or borachero, and from the fruit of which they prepare a very powerful narcotic drink called *tonga.* The Indians believe that by drinking this tonga they are brought into communication with the spirits of their forefathers. Dr Tschudi had once an opportunity of observing an Indian under the influence of this drink. Shortly after having swallowed the beverage, he fell into a heavy stupor. He sat with his eyes vacantly fixed on the ground, his mouth convulsively closed, and his nostrils dilated. In the course of about a quarter of an hour, his eyes began to roll, foam issued from his half-opened lips, and his whole body was agitated with frightful convulsions. These violent symptoms having subsided, a profound sleep of several hours succeeded. In the evening he again saw this Indian; he was relating to a circle of attentive listeners the particulars of his vision, during which he alleged he had held communion with the spirits of his forefathers. It would appear, too, that the seeds of some species of datura, as well as that of the hyoscyamus, were used in the Grecian temples for the purpose of assisting in the production of the gods. They were thrown on the fire along with incense and precious perfumes; and after breathing this for a time, the individual was thrown into that state in which he had no difficulty of seeing apparitions of the gods.

We now come to speak of *opium* and its preparations as a means of producing spectral appearances.

The first effect of opium when introduced into the system by any of the means we have related, is, *first*, to produce a state of excitement, and, *secondly*, a state of depression. In small doses it first excites the heart and arteries, and causes a slight exhilirating effect upon the mind. A pleasurable state of the whole system follows, and a capability of greater exertion in this is soon followed by the symptoms of depression, which are marked by a diminution of muscular power, and of susceptibility to the impressions of external objects, and by a desire of repose with tendency to sleep. In a larger or full medicinal dose, the stage of excitement is more speedily followed by that of depression and by profound sleep. The sleep is most generally attended with dreams, often connected with the previous current of ideas, sometimes pleasant, and at other times frightful. The regular opium-eater feels, from a sufficient dose, his mental faculties become more acute, along with a sense of calmness, comfort, serenity, and happiness. It is chiefly, however, when a large dose is taken, and sleep is prevented from occurring, that visionary appearances are produced; and I have already referred to this, when speaking of the ancient practice of anointing the body of the votaries of the heathen gods. In these liniments, opium formed an important part; and there can be no doubt that they had the effect of producing visions. But we have in recent times innumerable instances of apparitions manifesting themselves to sensitive individuals under the action of this drug; and the Confessions of an English Opium-eater may be consulted for further information on this subject.

The late Dr Gregory experienced in his own case a marked instance of this kind. He had been called to the north country to visit a lady in consumption, and, in returning, to prevent sea sickness, had taken a moderate dose of laudanum. While lying on a couch in the cabin, the figure of the same lady appeared before him in so distinct a manner, that her actual presence could not have been more vivid. He was quite awake, and fully sensible that it was a phantasm produced by the opiate acting upon his mind, excited at the time in recalling the painful nature of the case he had been visiting.

Dr Abercrombie[*] has related the case of a gentleman who, after the use of a large opiate, saw in one watchful night a long and regular exhibition of characters succeeding each other with all the regularity of a theatrical exhibition. He heard their conversation and long speeches, some of which were in rhyme. He was quite awake, and quite sensible that the whole was a phantasm. Dr Gunning mentioned to the Medico-Chirurgical Society an instance in which he took an opiate to correct some painful feelings of disordered stomach. He lay down, but did not sleep, and shortly afterwards saw before him a figure which he knew to be a phantasm produced by the opiate. He put his head under the bed-clothes, for the purpose of dispelling it, but without effect.

The effects of the juice of the *Atropa belladonna* are so similar to other narcotico-acrid drugs, that it was not my intention to have considered them separately. A case, however, has been related to me by Professor Simpson which is equally remarkable and illustrative; it, I believe, is one of the few which arise from the use of this drug in recent times. "A patient of mine," says Professor Simpson, "used a suppository of belladonna instead of opium. She had the usual double delirium and intervening coma (during the second delirium if it may be called such); following the coma she spoke, &c., rationally, but continued for some time dressing her curls, or rather making that twisting motion of the fore-fingers of both hands which ladies employ for that purpose. But her hair was plaited and untouched. It was a kind of tactile illusion; she fancied she was arranging and feeling the curls, when she was not in reality doing so."

I come now to speak of a most important agent, little known till recently in this country, but apparently long known to the natives of eastern climes, and serving a most conspicuous part in their history and customs. I refer to the *cannabis indica*, commonly called hachisch throughout Egypt, Syria, and India, known as Indian hemp in this country, and which appears to be a plant differing little from that known to us here. "All those who have visited the East know well how widely the use of *hachisch* is spread amongst the Arabs especially, with whom it has become an article of use not less necessary than opium to the Turks and Chinese, and alkoholic liquors to the people of Europe."[†] The preparation which is most commonly used is the fresh extract, which has a green colour, a strong and nauseous taste; it is usually, therefore, combined with aromatics and syrup. The electuary most generally employed is that of the Arabs, and which they call *dawamese.* It appears to be agreeable to the taste, especially when freshly prepared. It does not, however, lose its peculiar properties by keeping. From the observations of M. Moreau, it results that the electuaries and extracts of this substance, which are commonly to be found in India, are never pure. They are generally mixed with other substances, such as opium, the extract of datura, and other narcotic drugs.

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[*] On the Intellectual Powers, p. 359.

[†] Du Hachisch et de l'Alienation Mentale, par J. Moreau de Tours.

The magical electuary, which has been described by Kempfer* and quoted by Sauvages,† contained the pollen of the cannabis, opium, the seeds of the datura, and aromatic spices. The effects which are said to have been produced by it are certainly sufficiently wonderful, but seem to have been produced more by the action of datura than that of opium or cannabis. Another circumstance which renders it most probable that the active ingredient of this magical electuary is owing to the datura is what has been stated by Sauvages to be a common belief, viz. "that its effects are to blindfold a husband while an adulterer seduces his wife." It will be remembered that this has been already mentioned as one of the effects which the Portuguese ascribe to the inspissated juice of the fruit of the datura. And the description which Kempfer gives of the effects of it with Brahmin virgins, who are drawn out of the temples after having had this magical electuary administered to them, to exhibit their dancing and crying, the twisting of their limbs and eyes, as well as other unbecoming actions, until they are fatigued and fall asleep; after which they are shown to the people as good spirits delivered from demons, their god (Wisthnu) being appeased.

The extract of Indian hemp, for the purpose of producing delightful sensations and visionary appearances, should be taken several hours after meals; and M. Moreau mentions that he has found coffee aid in the production of the appearances, shorten their duration, and render them momentarily more intense.

M. Virey‡ has attempted to prove that its use has been known from the highest antiquity,—that it was the *Népenthes* of Homer, and that it was used at Thebes in Egypt by the women of Diospolis, who were said to have alone the secret of dissipating anger and melancholy. That it has the most wonderful effects in producing spectral appearances, has been abundantly proved in the able work of M. Moreau, who has taken it repeatedly himself, and persuaded many of his friends to do so likewise. It will be unnecessary to detail the very numerous illusions which M. Moreau beheld while under the influence of the cannabis, referring those to his most able and interesting work for a fuller account. I shall only, therefore, relate a few of them.

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* Kempfer's Amoenitates Exotic. Fasc. iii. p. 650.
† Sauvages' Nosology, vol. ii. p. 245.
‡ Bulletin de Pharmacie. 1803.

A short time after taking *Huchisch,* M. Moreau, in eating some oysters, fancied that he saw other two individuals beside him anxious to taste this narcotic drug. Shortly afterwards he saw the portrait of his brother become animated, present a forked cue, black, but terminated by three coloured lanterns, one red, one green, and the other white; the same apparition appeared several times in the course of the evening. He laughed, and danced, and fell on the ground. He then saw lights, heard noises, felt a sense of suffocation, and thought that he was falling down deep pits. He then drank a little lemonade, and suddenly passing his hand through his hair, felt millions of insects, which seemed to devour his head. One of the insects seemed to him to be in labour, and he immediately sent off for an accoucheur. The animal had taken up its abode on the third lock of his hair, to the left of his forehead, and soon brought to the world seven little creatures. He spoke to persons that he had not seen for several years, and recalled most vividly some companions that had dined with him in Champagne eight years before. "General H. presided at a fish surrounded with flowers; he had at his left M. K.; they were before my eyes, and I felt that they were with me." Visions after visions occurred, and twenty times he felt himself on the point of committing an indiscretion. "I cannot describe," says he, "the thousand fantastical ideas which passed through my brain during the three hours that I was under the influence of *Hachisch.*" M. Theophile Gautier has also given an account of the principal incidents of his visions from the use of *Hachisch.* He saw rapid changes of colours like a kaleidoscope. "I saw, besides my companions, disfigured half-men, half-plants, and birds;" at which he laughed, threw his cushions into the air, and turned rapidly round like an Indian juggler. One of these imaginary friends addressed to him, in Italian, a discourse upon *Hachisch,* which he immediately translated into Spanish. After a few minutes he found himself quite restored, without headach or any disagreeable symptoms, and much astonished at what had passed.

The *cannabis,* therefore, seems to give rise to illusions both of sight and hearing; and at the same time it would appear, that individuals whom you have never seen before, are converted into images of well-known and beloved friends; and we can easily imagine how this power was made use of by magicians and sorcerers of old. In the faces of old women the most angelic countenances are recognized; spectral visitors of all sexes, ages, and countries come and go; and even are in constant attendance. Again, the most discordant tinkling sounds and the most delightful harmonious music are occasionally heard, as well as the voices of individuals that are remembered, and long speeches in different languages, songs and the like.

I have only a few sentences left to relate the effects of the coca or coqua leaves, an exciting narcotic or intoxicating agent, used by the Indians of Peru. They are the produce of a small shrub, the Erythroxylon Coca of Lambert.* "The Peruvian, according to Poeppig, is rather a melancholy being, prone to despondency and depression of spirits; but when he has recourse to the leaves of the coca, the mental gloom leaves him, his imagination becomes heated and his spirits elevated, and he enjoys the *happiest visions* amidst every appearance of external misery." Another most remarkable circumstance regarding its use is mentioned by the same author. The individual who gives himself up to the masticating of this drug is called a coquero. It is said that when he masticates a sufficient quantity of coca leaves, he betakes himself to some desolate place, some secret retreat in a valley of the Andes, and remains under a tree or in a cave for two or three days in a state of half excitement and apathy, forgetful of the world, society, its duties, and utterly indifferent to the dangers with which he is surrounded from storms, wild beasts, or the casualties of the forest. It would seem, too, to have the power of enabling them to endure great fatigue and privations.

There is another substance, however, which I have already casually referred to, and which is not usually put down in the category of those liable to produce visionary appearances,—I mean some of the preparations of sulphur with carbon and oxygen. The ancient priests, sorcerers, and necromancers were in the habit of using, on all occasions when they had to employ their dark art, various suffumigations, which are usually styled noxious. The exhibition of calling up the images of the gods in ancient temples, was often produced by means of throwing on the smoke of incense, or other noxious vapour, the reflection of mirrors, which no doubt were so arranged as to have some effect on the imagination of the individual. This I have previously more particularly described elsewhere. In the accounts which have been handed down to us of more modern necromancy, we have still more decided evidence that, in addition to the impostures brought about by the arrangement of mirrors, the smoke of sulphur and its preparations were also most abundantly used.

In a very full account of this art which has been left us by the celebrated Benvenuto Cellini, we find that the priest who exhibited began by drawing a magic circle with the most impressive ceremonies imaginable, and beyond which the individuals could not pass, (this was obviously to keep them within the range of the reflection of the mirrors.) He then brought "assafœtida, several precious perfumes, and fire, with some compositions also which diffused noisome odours;" and in the account which is given of the management of these, we find that, according as the priest wished to produce the visions, he used the compositions which diffused the noisome odours; or to put them away, he used the precious perfumes. What the compositions were which diffused these odours, the celebrated conjurer and master-mason revealed to Dr Alderson of Hull. "He told me," says Dr A., "that he would give me a recipe for a preparation of antimony, sulphur, &c., which, when burnt in a confined room, would so affect the person shut up in it, that he would fancy he saw spectres and apparitions."

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* Edinburgh Medical and Surgical Journal, vol. lxix., No. 175, p. 493.

A series of circumstances would seem to bear out, that the plan of the master-mason to produce visionary appearances may not have been altogether ineffectual. Dr Braid has related the cases of a number of miners at Leadhills, who went down into a pit, the air of which was loaded with sulphurous acid gas, who, amongst other symptoms, experienced headach, giddiness, and some became furious and maniacal; and it is not improbable that it is from the inhalation of some of the gaseous productions of sulphur, that the giddiness and visions arising from the inhalation of marsh miasmata arises. Professor Simpson, in speaking of the inhalation of the bisulphuret of carbon, says, that he has given it to about twenty individuals, in several of whom it produced depressing and disagreeable *visions*. Morgagni mentions the case of a scavenger or nightman, who, in the course of his nocturnal duties in some of the latrines of Padua, was much frightened by apparitions; and I have somewhere seen stated, although I cannot fall in with the reference, that the individual whose duty it was to clean out the Fossé d'Aisance of Paris, was in the habit of witnessing phenomena of this kind.

It appears that the sites of the ancient temples, especially those which were dedicated to Apollo and Trophonius, were generally erected over caverns and springs, from which noxious vapours used to be evolved. Diodorus[*] the Sicilian relates that "the oracle of Apollo at Delphi was discovered by the leaping of goats when they approached it. The shepherd went himself to view the cavern, whereupon he was seized with leaping, dancing, madness, and the power of foretelling things to come. This being noised abroad, multitudes came, and were all inspired after a similar manner."

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[*] Potter's Archæologia, vol. ii. p. 322.

An oracle of Apollo was also erected at Cirrha, where there was a cavern:—

> "Not Cirrha's Cave with more unerring skill
> Unfolds the King of Heaven's eternal will."

Apollo had an oracle near the Castalian fountain, and named after Daphné, his beloved mistress, or the laurel into which she was transformed, the waters of which were also endowed with a prophetic virtue.

The oracle of Trophonius at Lebadea, a city of Bœotia, was also erected over a fountain of this kind; and Pausanias has related some curious effects which were experienced on descending into the cavern, which, it would appear, all had to do if they wished to be favoured by an apparition of the god and a favourable response.

At Dydiana, a place near Miletus, where there was a temple of Apollo Didymæus, previous to prophesying, the priestess inhaled for some time the vapour of a sacred fountain.* The oracle of the Colophians at Claros was delivered by a priest, who prepared himself by drinking the water of a basin enclosed in the grotto of Apollo. Pindar and Plutarch assure us that the escape of the sacred vapour was accompanied with a sweet odour; but it is most probable, as M. Salverte has it, "that the priests sought with the assistance of artificial perfumes to conceal the fœtid odour of the gas which issued from the cavern." Crelinus, later than the time of the Grecian oracle Porphyry,† unhesitatingly affirms, that the exhalations of the earth, and the water of certain fountains, tended to excite divine ecstasies, in the midst of which the oracles were delivered. "The Tripod of the oracle of Delphi was placed," says Dr A. T. Thomson, "at the mouth of the cavern, whence issued the vapour which was supposed to be carbonic acid gas; but that is not sufficiently intoxicating, and I suspect the gas was sulphurous acid, as it caused almost frantic delirium, as already mentioned. The secondary effects are also similar to those experienced by the Delphic priestess, viz. vertigo, nausea, and great weakness of the lower extremities." It is said, too, that the Pythians of the oracle of Apollo were frequently obliged to be changed in consequence of the deleterious nature of the gas on their constitutions, and sometimes, indeed, they fell victims to its deleterious influence, and died in a few days. I have already referred to the gases evolved from caverns of this kind, which had the reputation of being carbonic acid, and of producing effects similar to those which we have been considering. This seems to have been a very popular opinion. Dr Thomson seems to refer it to sulphurous acid gas, but certain objections might be adduced regarding both of these. In the first place, the effect of carbonic acid gas on the animal constitution is totally different from those we have been describing; and, besides, both it and sulphurous acid gas are so abundantly absorbable by water, that it is difficult to conceive it remaining so long in contact with water in a damp cavern, and possessing much virtue. For although the gas was abundantly generated, yet the constant moisture of a cavern, and trickling streams from it, would soon condense it and carry it away. I believe that in sulphuretted hydrogen gas will be found the substance most likely to have produced the effects we have been recording. It is an abundant natural production; water is readily impregnated into it, but it can remain a long time in contact with water without being absorbed. Its fœtid order, too, as remarked by the ancients, which even required the mixing of perfumes to overcome it, reminds me of the description which Dr Simpson has given of his trials of the sulphuret of carbon;—he tried to mix various essential oils with it to subdue its disagreeable smell.

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* Jamblichus de Mysteriis, cap. xxv.

† Eusebius.

Of the cases of apparitions which have been recorded, and those which I have detailed, it is curious to remark the relative frequency with which the different senses are deceived.

The organ of sight was alone deceived in 35 instances; the sense of hearing alone in 4; the sense of touch alone in none. But in 3 instances, the senses of hearing and seeing were together deceived; in 1, the sense of sight and touch combined; and in 2, the senses of hearing, seeing, and touch.

It would appear, then, that illusions of sight are by far more frequent than those of any other organ of sense, while the most uncommon is that of touch alone. The frequency by which the eye conjures up apparitions is only what might be anticipated, when we consider that it is by it that we take cognizance of the form and colour of objects, and that, when they present themselves to us in the form of recalled impressions, or ideas assuming a bodily form, it is by the form, colour, and general appearance which they assume, that we recognise them as similar to what we were in the habit of formerly seeing. Of the two senses, taste and smell, which have not been mentioned, there is no instance on record of the illusions of either. There is, indeed, a most intimate relation between all the senses, and especially between the two just named, so that probably the wonder really is how one should not always participate in the deceptions of the other.

Popular traditions and superstitious beliefs have noticed a peculiar smell of sulphur that all apparitions would appear to possess; and Mr Aubrey tells us of an apparition that disappeared with a curious perfume and melodious twang. It is most probable, however, that fancy has surrounded such appearances with a portion of the sulphurous element to which they were supposed to belong. I have already stated that sulphur and its preparations were used in former times by conjurers and necromancers, for the purpose of so acting on the brain as to produce visions; and the gases of some caverns and springs had the same effect; and it is not improbable that such practices have assisted in strengthening the belief originally derived from superstition, that apparitions are accompanied with a sulphurous smell.

Illusions of the sense of hearing alone occur rarely.

> "The airey tongues that syllable men's names,"

as the poet expresses it, seem most frequently to be referable to some accidental production of sound. When we consider the many objects in nature which give out sound of different kinds and intensities, according as the wind blows in different directions or varieties of force, we need not wonder that every valley and hill side, every ruin and old tower, should have its peculiar genii of this kind. Sir W. Scott has detailed an instance of this kind, which gives an excellent idea from what slender means sounds, and the impressions they at the time make upon the mind, arise. Sir Walter was walking in a wild and solitary valley, with a deaf gentleman as his companion, when he heard the sound of the baying of a distant pack of hounds. He called in his own dogs and then listened, and still it reverberated in the valley. He immediately addressed his friend, and said that he regretted his infirmity the more at present, as otherwise he could have let him hear the cry of the wild huntsman. The gentleman, who used a hearing tube, turned when spoken to, and the cause of the phenomenon at once resolved itself into the singing of the wind in the instrument which he used.

It is to natural causes of this kind that many of those sounds which are to be heard in certain places, and which superstition has stamped as supernatural, foretelling approaching ruin or death, are to be referred. The natives of the Hebrides, for instance, recognize in some sound of this kind, the voice of a relative whispering the name of the one, whose fate is at hand.

While most of the illusions of hearing are to be explained in this way, some are not. The case of Mrs A., as related by Dr Brewster, is an instance of this. She heard her husband's voice calling her for a lengthened period of time by name; and Dr Johnson retained a deep impression that while he was opening the door of his college chamber, he heard the voice of his mother call him by name. I have already been privileged to detail, through the kindness of Professor Alison, a most interesting case of this kind.

Mozart's account of his moments of inspiration are interesting in this respect. He says, "When I am walking or in a carriage, what comes I hum to myself as it proceeds, then follows the counterpoint and the clang of the different instruments."

In no recorded case has the sense of touch been alone deceived, but we have then instances where a false impression was made upon it, along with the deception of another sense. In *two* instances was the touch deceived along with sight, and in *three* with both sight and hearing.

When an individual has the mind wrought up, witnessing a curious or painful illusion, a sudden twinge of pain or cramp, or benumbed feeling in a part or organ of the body, at once becomes connected with the train of thought going on in the mind at the time, and is converted into a sudden blow, the strong grasp of a hand, or the cold touch of a dead person. To this belongs one of Beaumont's illusions, and the late Dr Abercrombie has detailed another. A lady, on retiring from a party one evening, went into a dark room to lay aside some part of her dress. She saw the image of death as a skeleton, with his hand uplifted and holding a dart, which struck her on the left side. The same night she was seized with fever, attended with inflammation of the same side, and doubtless it was the sudden attack of pain of the commencing inflammatory attack, which gave rise to the idea of the blow. In the same way Mr H.* (whose illusions I formerly related), saw the apparition of a friend long deceased, heard him speak, and felt the grasp of his hand upon his arm. This same feeling Mr H. remembered so well, that he afterwards recognized it again and again, in cramp of the triceps muscle of the arm occurring at the time, and no doubt acting on his deceived ideas.

In conclusion, I have shortly to refer to the very curious manner in which illusions of one sense lead on to another. Thus, during an optical illusion, a very slight concurring sound seems to be turned by the individual into a sound corresponding with his other illusion, and is actually converted into an aural one. In the same way, a pain occurring in any part during the course of an optical illusion is at once converted into a tactile one. The spectre which is seen, by a little accidental noise, speaks; and by a corresponding accidental twinge of pain it grasps or strikes the individual. Instances of these compound forms of illusions are rare. Dr Abercrombie has related a most interesting one, and which I have formerly quoted. Mr H., the gentleman whose case I formerly referred to, felt as if some one grasped his arm;

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* Edin. Med. and Surg. Journal, No. 154.

it gave rise to a vivid train of ideas in connection with the subject of his meditations, and the tactile illusion immediately led to corresponding optical and aural ones. Dr Laycock, of New York, was kind enough to detail to the Medico-Chirurgical Society of Edinburgh, at a late meeting, a series of most interesting and peculiar illusions of this kind. Dr L. had received an injury of the head, and was slowly recovering from it; he was not however feverish, and was quite sensible, and conscious of what was going on around him. His senses, however, seemed to be preternaturally acute. In this state, while lying quietly in bed, the slight tinkling sound of the movement of the poker or tongs gave rise to the idea of the hammering of iron on anvils; and on directing his attention to the counterpane, on which numerous little tufts were placed, each of these was converted into the appearance of a multitude of little men, with diminutive hammers and anvils, all busily engaged at work. In like manner, the noise of water gave rise to the idea of washerwomen, and soon the hill-side was covered with numerous washerwomen, all busily plying their vocations like the little smiths with their anvils.

We have more particularly explained, that according as the mind is occupied with a particular train of thought or subject, the illusions or apparitions which take place, whether during disease from the use of drugs, during intense fear, or from superstitious dread, are all referable to a renewal of impressions on the mind. Thus the illusions of delirium tremens are characterized by the reference to the usual occupation of the individual. The illusions of insanity and hypochondriasis are most generally so. The illusions produced by drugs are most frequently so. The inhalation of chloroform rarely gives rise to such; but in one instance that I have elsewhere recorded, the phantom produced was always the gentleman's wife,—the object nearest his affections and thoughts. So the drugging used in the ancient temples, most probably acted by reviving images of the mind that had been previously and recently impressed on the devotees.

Many examples of this are to be found in the superstitious beliefs and fears of the middle ages. Dr Hibbert has traced with peculiar accuracy, how precise the ordinary descriptions of demons and spirits were to the grotesque carvings and sculptures of the middle ages.

PART II.

CRITICAL ANALYSIS.

Art. I.—*The Pathological Anatomy of the Human Body.* By Julius Vogel, M. D., Professor of Clinical Medicine at the University of Giessen. Translated from the German, with Additions, by George E. Day, M. A. and L. M., Cantab., Member of the Royal College of Physicians; Physician to the Western General Dispensary; Lecturer on Histology and Animal Chemistry at the Middlesex Hospital Medical School; Member of the Pathological Society of London; and formerly Senior President of the Royal Medical Society of Edinburgh. Illustrated by upwards of One Hundred plain and coloured Engravings. London, 1847. 8vo, pp. 589.

This work is particularly recommended to the medical reader by presenting a compendious and instructive view of the present state of knowledge on pathological anatomy. The author is already well known by his *Icones Anatomico-Pathologicæ*, and by his labours in the application of the microscope to elucidate the changes which take place in different textures and organs under the influence of disease; and in the present work he gives a summary of the results obtained not only by his own researches in this way, but, as far as is practicable, by those of Grube, Gluge, Henle, Canstatt, and other inquirers, so as to furnish a general view of the science in its present state.

It is almost superfluous to observe, that the science of morbid anatomy naturally resolves itself, like that of healthy anatomy, into two great divisions—the first, general morbid anatomy; and the second, special morbid anatomy. To the first of these divisions only the present volume is confined. But the translator states that the present treatise is to be followed by a second, devoted to the explanation of the changes taking place in the individual organs of the animal body.

The present treatise consists of ten chapters, preceded by an introduction. In the introduction the author gives a general view of the objects of pathological anatomy, traces its connection with the medical sciences in general, and then notices its particular relation to individual branches of medical science. In this discourse he adverts to the sources from which information is derived; to the mode in which the science ought to be studied, cultivated, and its progress extended; and to the means of counteracting the influence of various fallacies, and views too partial and limited, or altogether erroneous.

The first three chapters, on the abnormal development of gaseous matters, on the abnormal accumulation of aqueous fluids, and on the pathological relations of the blood, are of a general nature.

Gaseous fluids may be formed abnormally amidst the tissues, or from the tissues, or within the cavities of the human body under the following circumstances:—1*st*, the external pressure of the atmospheric air, as is observed in ordinary emphysema succeeding to wounds and injuries of the air passages; 2*d*, in consequence of decomposition, fermentation, and putrefaction, as is observed in traumatic and spontaneous gangrene, when the serum of the blood appears to have undergone decomposition; and 3*d*, when gas is secreted by different parts of the body, as the free surface of the alimentary canal, or the free surface of the skin, as in the case recorded by Sir Francis Smith.* These accumulations correspond to the *Pneumatoses* of nosological authors.

Abnormal collections of aqueous fluid,—that is, aqueous or serous fluid in quantity greater than it ought to be, and in situations where it ought not to be,—correspond to the dropsies of nosologists. These may take place in the following situations,—1. within one of the serous cavities; 2. within the parenchyma of certain organs; and in both cases, the fluids may be distinguished into serous dropsy, fibrinous dropsy, in which the fluid contains dissolved or suspended fibrin, and false dropsy, in which the fluid differs essentially in chemical composition from either of the preceding forms.

The author thinks that various facts lead to the inference, that both in serous and fibrinous dropsy, but more decidedly in the latter, a purely mechanical permeation of the *plasma* of the blood takes place through the walls of the blood-vessels. The chief difficulty is, why the permeation of plasmatic matter should take place in the one case and not in the other. The author seems disposed to refer this difference to the influences of *endosmosis*, or some particular state of that faculty. The question, he allows, cannot be satisfactorily answered in the present state of knowledge. It is nevertheless probable, that it admits of the following solution, namely, that serous dropsy owes its origin to permeation of the fluid of the blood through the walls of the veins, while fibrinous dropsy arises from a similar permeation through the walls of the capillary system.

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* Dublin Medical Journal, January, 1841, p. 454. In this case the gaseous fluid was secreted by the surface of the alimentary canal and of the bladder, as well as that of the skin.

He afterwards observes, in confirmation of this view, that the veins have thick walls consisting of several layers of cells and fibres, while the walls of the capillaries are very thin and delicate; that serous dropsy is associated with dilatation of the veins and attenuation of their walls; while microscopic examination of the capillary system shows that dilatation of these vessels, and an attenuated state of the walls, precede, and is associated with the occurrence of the fibrinous fluid, either in the parenchyma of an organ, or within a cavity; that this shows that dilatation of the capillaries is the cause of the effusion; that in the gradual transition of the capillaries into veins, no strict limit can be traced between fibrinous and serous dropsy, and that the one may easily pass into the other; and that many causes which produce dilatation of the capillaries may produce the same effect in the veins, and hence the two processes may be conjoined.

In serous dropsy, however, the causes of venous dilatation are frequently mechanical, as in the case of contraction of the auriculo-ventricular aperture, hypertrophy, and kirrhosis of the liver, and similar direct impediments to the return of the venous blood. Hence all these causes of dropsy become included in the department of pathological anatomy. With fibrinous dropsy he thinks it is different, as the dilatation in this case is dependent on dynamic causes, the investigation of which would lead into the department of nervous pathology. He therefore restricts himself to the enunciation of the proposition, that fibrinous dropsy is essentially dependent on the capillary system; and that it is associated with, and, for the most part, arises from dilatation of those vessels, and tension and attenuation of their walls.

The connection of this view of the etiology of fibrinous dropsies with the circulation of the blood, and the process of nutrition in the healthy and morbid states is manifest and intimate. The author, indeed, allows, that to this many portions of the process of inflammation may be referred. "The so-termed exudation, and the effusion of plastic lymph, are nothing more than the result of this same process; and the general nutritive fluid which we term exudation, or plastic lymph, is nothing more than the fibrinous fluid now under consideration. I make this brief statement with the view of avoiding unnecessary repetition. I shall subsequently have occasion, in many places, to take up the thread, which for the present I drop, and pursue it further."

The explanation now given obviates in a great degree any objection that might be urged either against the establishment of a head of dropsies as idiopathic disorders, or against the association of the order of inflammatory or fibrinous dropsies with that of secondary dropsies, or those from obstruction and impediment to the venous circulation. The author not only here admits that the fibrinous dropsies depend on a certain morbid state of the capillary system of vessels, but he allows that they are often connected with the inflammatory state, and with the formation of inflammatory products. This is equivalent to saying that fibrinous dropsy is the result of the inflammatory process. That it is only the last event in a chain of phenomena of which inflammation is either the first, or at least a very important and essential link, are inferences with which a considerable number of English pathologists have been for many years familiar.

It may, nevertheless, justly become a question how far it accords with the principles of philosophical arrangement, to form in a system of pathological anatomy a general category of lesions, from phenomena which are avowedly and undeniably mere effects; and what good practical purpose it serves to fix the mind of the student on effects which are admitted to arise from causes, the nature and operation of which have been long more or less familiar to the mind of the intelligent physician. Dropsy has been a name so much abused, and which is now made to cover, if not conceal, so many different lesions, that the wisdom of admitting it into any system of pathological anatomy, but as an effect, may justly be questioned. The practice has doubtless antiquity and long usage on its side; but, when we observe, in the present chapter, those serous collections which are the result of mechanical impediment to the venous circulation, placed in this arrangement in close juxtaposition to those effusions, which are the morbid products of the inflammatory orgasm, we are tempted to ask what is the use of pathology and pathological anatomy, but to demonstrate the erroneous nature and unprofitable character of all such arrangements.

The proper place for such a category as that of dropsies, especially if the name is made to comprehend so many different lesions as are introduced in this chapter, would be in a system of semeiology or semeiotics. There it might be placed as an effect and symptom of different morbid states either of organs or of the system at large. In any system of pathological anatomy, however, which is founded on correct philosophical principles, the term dropsy will naturally and justly arrange itself not as an individual and substantive lesion, but under the head of the different lesions of which it is the consequence and the termination. Thus dropsies from disease of the heart would naturally be arranged under the different lesions of the heart, its chambers, and its apertures. Dropsies dependent on hypertrophy of the liver, *kirrhosis*, and similar affections of that gland, would be classed under the head of maladies of the liver. Dropsies from affections of the kidneys would be placed under *steatosis*, and granular disease of these glands. And lastly, dropsies which ensue in chronic disease, tuberculation, and similar lesions of the *pleura*, *pericardium*, and *peritonæum*, would be properly placed under maladies of the serous membranes.

If any additional reason were required to show the questionable character, if not the impropriety, of this mode of arranging dropsical collections, it will be found in the third head of dropsies in the present chapter, or that denominated false or spurious dropsies.

False or spurious dropsy, as may be anticipated, is no dropsy at all. This name the author, in imitation of some of his predecessors, applies to abnormal accumulations of fluid taking place in certain situations, in consequence of the temporary or permanent obstruction or closure of an excretory duct. Thus a calculus sticks in the upper end or in the course of the ureter, or a clot of blood or lymph blocks up its canal. The urine is thereby impeded in its transit to the bladder, and is accumulated in more or less quantity in the upper part of the ureter, in the pelvis, and in the calyces of the kidney. As accumulation proceeds, and obstruction is continued, the kidney is distended, expanded, and enlarged, while its texture is more or less extenuated. This has been called dropsy of the kidneys, and as such is minutely described by Walther. In like manner, obstruction takes place in the Fallopian tubes, or at the *os uteri;* and in like manner fluid is accumulated, in the former case, within one or both of the tubes; in the latter, within the uterus. The former lesion has been called dropsy of the Fallopian tubes, the latter dropsy of the uterus (*Hydrometra*). These names are, in all respects, improper, because the lesions which they are employed to designate present none of the genuine characters of dropsy, and bear no resemblance to dropsy in other organs.

M. Vogel does not appear to favour much this category of lesions; but neither is he very strongly disposed to condemn them. He merely observes, that the fluids thus accumulated are liable, in consequence of endosmotic action, to become altered. Thus the fluid collected in instances of obstruction of the ureters is no longer normal urine.

The third chapter, on the Pathological Relations of the Blood, treats of these in the following order; 1*st*, physical and chemical changes, including changes in colour, consistence, in the mode of coagulation, in odour and taste, the buffy coat, changes in the corpuscles, in the proportion of water, in that of albumen, in that of the salts, increase of urea, the presence of foreign matters in it, as free lactic acid, carbonate of ammonia, pyin, sugar, bile-colouring matter, pus-corpuscles, entozoa, and general changes; *2d*, changes in quantity, including general *hyperaemia*, general *anaemia*, local *hyperaemia*, venous *hyperaemia*, *hyperaemia* of the capillaries, congestion and stasis, local *anaemia*; *3d*, extravasation of blood; and, *4th*, solution of haematin, and saturation of the tissues with it.

These subjects we examined so fully in the account of Dr Simon's Animal Chemistry,* and the work of Dr Golding Bird on Urinary Deposits,† that to enter again on them would involve repetition. We have only, then, to say, that, in the present chapter, the reader will find a succinct and instructive account of the pathological relations of the blood.

The seven following chapters are of a more particular character; and in them are considered and explained the phenomena and characters of the changes in the fluids and solids, which constitute the science of pathological anatomy.

In the fourth chapter, ON THE GENERAL RELATIONS OF PATHOLOGICAL EPIGENESES, the author gives a general view of the leading characters of those processes and formations which essentially distinguish textures in a morbid state.

The term *Epigenesis* (Επιγενεσις) is adopted from the Greek to designate new formations, that is, all those new states or changes in texture which are regarded as the product of diseased action. In the primary formation of the body, the author observes, and in the course of its subsequent nutrition, new formations, which consist of elementary particles and tissues, arise or are formed, interpolated, as it were, between those already existing. A process somewhat similar is of frequent occurrence in the case of pathological formations; and so frequent, indeed, are these morbid epigeneses, that the greater number of the changes, which pathological anatomy demonstrates after death, may be arranged under this head.

Pathological epigeneses or formations naturally arrange themselves into two general orders,—the organized and the unorganized. Between these orders the distinction is twofold. The first difference is morphologic, or that which is presented by the perfect form and internal arrangement of particles in organized bodies, and which also belongs to the organized pathological epigeneses. Unorganized bodies are void of this arrangement of constituent particles, the most perfect form they can assume being that of a crystal.

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* Edinburgh Medical and Surgical Journal, Vol. lxiv. p. 477. Edinburgh, 1845.
† Ibid. Vol. lxix. p. 198. Edinburgh, 1848.

The second difference is genetic, or connected with the mode of formation. Inorganic formations are always produced and enlarged according to the operation of chemical laws. Organized formations, on the other hand, are under the influence of the laws which regulate organic life.

It seems singular that, in this distinction, the author adverts not to the fact, as a leading distinctive character of organized bodies, that they consist of hollow tubes, arranged in a definite manner, in which are contained fluids, which are moved in certain directions through them. This, it appears to us, is the leading and invariable characteristic of all organic bodies, distinguishing them most completely from inorganic bodies, which possess no such definite arrangement of hollow tubes, and in which there is no intestine movement of fluids; and the character belongs equally to normal or healthy, and abnormal or morbid organic structures.

Pathological growths require for their formation a matter, from which they may be produced. As the healthy tissues are poured forth in a fluid or semifluid state from the vessels of the *ovum*, and themselves become penetrated by hollow tubes or vessels from those of the womb or matrix, whatever it be, so those tissues or growths, which are formed under the influence of diseased action appear first in the form of liquid or semiliquid materials, in which hollow tubes or vessels are forthwith formed, and by means of which they are at once connected to the original sound tissue, and are nourished or grow and become enlarged. To this formative matter the name of *plasma* has been applied, as indicating its capability of being moulded or formed according to certain laws, both in internal arrangement and in external figure.

Of this *plasma* it is a necessary character to be amorphous, that is, neither crystalline, like inorganic products, nor having the definite arrangement of constituent particles called organization. A structure already formed assumes that property only by divesting itself of its shape, and becoming again structureless.

Any *plasma* may act as formative material, either for organized or for unorganized products, or for both at the same time. The plasma for unorganized formations, which is usually an aqueous solution, from which deposits are produced, or crystals are formed, in accordance with chemical laws, the author names *mother-liquid*. To the matter giving rise to organized formations, which are chiefly produced by the formation of cells, he applies the term *Cyto-blastema*, or simply *Blastema*; and the *plasma*, or material from which products, organized and unorganized, are developed, he designates a *mixed plasma*.

Now the mode in which pathological formations are produced from a *mother liquid*, is essentially different from that in which they are generated from a *cyto-blastema.*

Almost any fluid in the body may serve as a mother-liquid for morbid formations, if a portion of the dissolved unorganized or organized matters assumes an insoluble condition, and is separated as a precipitate. The conditions under which this takes place are numerous; but, so far as is yet known, they are regulated simply by chemical laws, and by physical properties.

The cyto-blastema or formative plasma of organized morbid formations is usually liquid, at least at first. Fibrin and protein compounds are the chief agents; and when traced to their source, they are always found to be formed from the blood, in some few cases from chyle and lymph. The mechanism, as it may be termed, of this formation, is not, as in the case of unorganized products, under the influence of chemical laws, but is regulated by those which are distinguished as vital, or peculiar to living bodies.

In the process of the development of this cyto-blastema, the author distinguishes two objects—one, the capacity or the capability for development; the other, the actual process. The first (*potentia*) may exist and not be called into action. The existence of the second (*actus*) always implies the existence of the first. The first passes into the second. The *cyto-blastema* can be developed only within, or in connection with, the living body. After death it has no existence, and cannot be formed. By this character the cyto-blastema, or developing energy of morbid production, is to be distinguished from those morbid states connected with, and dependent on, the presence of parasitical animals, which are organisms independent or self-existing, and may be formed in the dead body.

As to the ultimate structure of these morbid productions, there is every reason to believe, that they are formed on the same type as the tissues of the healthy body, and that, like them, they consist of very minute cells, in general nucleated. Schwann, in confirmation of the truth and general existence of his theory of cellular formation, remarked that he had observed the same arrangement in many morbid products. Though this theory has been opposed in many quarters, and only adopted with modifications, as by Arnold, Henle, and Vogt, yet there is evidence to show, that it is, to a certain extent, well founded, and that this is observed also in regard to the new formations which take place in disease. According to Schwann, development is always dependent on the formation of cells in an amorphous *cyto-blastema*, and the formation proceeds in the healthy state in the following manner. First, one or more minute granules (*nucleoli*) appear, around which the cyto-blast (*nucleus*) is formed, and this again becomes surrounded with the cell-wall membrane, which at first closely envelopes the *nucleus*, but afterwards, in the course of growth, becomes separated from it, so as to leave a space or cavity between the cell-wall and the *nucleus*. This is termed the cavity of the cell, and is filled with a substance essentially differing in character both from the *nucleus* and the cell-wall. In the cell then formed, the *nucleus* is not in the central part, but is situate eccentrically at a point in the inner surface of the cell-wall. From these cells alone all organized products arise.

Now that a similar mode of development from cells takes place in pathological formations may be readily shown, Professor Vogel states in numerous instances. This process may be most obviously traced in the formation of *pus*-corpuscles, when they are produced from a fluid *blastema* on a free surface, or in a cavity connected with the exterior of the body. In such circumstances there are observed, first, numerous isolated granules, which become surrounded by a very delicate transparent cell-membrane, which subsequently forms so thick and opake a wall, that the *nucleus* cannot longer be seen through it. On adding acetic acid, however, which either dissolves the cell-wall or renders it transparent, the *nuclei* again become visible. Though it may not be possible to trace the whole course of development in one and the same cell, it is, nevertheless, possible to distinguish the successive changes in the whole mass of cells with sufficient certainty. These, and similar changes, such, for example, as may be made on the formation of epithelium, Professor Vogel thinks confirm the inference that, in all essential points, the theory of Schwann is applicable to morbid formations. He admits, however, that individual cases furnish facts which do not coincide with the theory, and which would render some modification of it requisite.

Professor Vogel further thinks that it is impossible to be convinced of the existence of the *nucleolus* previous to the *nucleus*, or at least that the *nucleolus* is, as it were, the means of forming the *nucleus*, in the same manner as the *nucleus* forms the cell. If in some cases this takes place, it does not in all. He agrees with Henle in thinking, in opposition to Reichert, that the cellular theory, as represented by Schwann, represents only one of the various modes of development, of which the type in different cases may present very numerous differences.

The *nuclei* of morbid formations present great differences both in shape and size. They are round or oval; occasionally elongated and pointed, as in the formation of areolar tissue and simple muscular fibre. *Nucleoli* are sometimes distinctly visible; usually one or two in number, but occasionally three or four. Sometimes, however, no trace of nucleolus can be detected. The outline of the *nucleus* is often well defined and regular, in others imperfectly defined. The size of the *nucleus* is always minute, varying in diameter from the 600th to the 100th part of one line, but seldom exceeding the 200th part. The *nucleoli* are much smaller, their diameter seldom exceeding the 1000th part of one line.

In chemical relations the *nucleus* of morbid formations resembles that of healthy textures. It resists the action of acetic acid, which either dissolves the solid *cyto-blastema*, or renders it pale and thin.

It is impossible to enunciate any very general propositions in the present state of time regarding the presence or absence of these cells in morbid formations. Undoubted cells are observed in pus-corpuscles of a healthy or normal character, if such terms may be employed in speaking of purulent matter; and, occasionally, some say always, in enkephaloma and skirrhus. Pus-corpuscles void of *nuclei* are observed in instances of unhealthy suppuration. Other objects are also liable to be mistaken for these *nuclei*, and non-nucleated cells. Thus non-nucleated corpuscles, resembling fibrinous flakes, which occur in encysted tumours, and in pus from glandular organs, the author regards as epithelium. Colloid of the thymus gland furnishes an instance of a non-nucleated structure.

Any given morbid formation, when thus developed as a cell-form structure, may either remain in that condition, the original cells having attained their highest degree of developement, and undergo no other metamorphosis into other textures; or the cells may be converted into other forms.

In the first case two different results may ensue. *a.* The cellular formation may be persistent, and in its perfect form constitute a fixed integrant part of the organism. *b.* The cells may be transitory, breaking up, and being rejected or resorbed without being of any service to the organism, or contributing to its composition any permanent part.

This constitutes, therefore, a distinction into persistent and transitory, or temporary cells. Persistent cells are reproduced in the restorative processes instituted after destruction of the epithelium, as after burns and the application of blisters. Under the head of transitory cells fall many morbid products; for instance, purulent matter, and the malignant growths, as tubercle, enkephaloma, and skirrhus.

In the second case, when cells in the normal state are converted into other forms, they may either be fused together by union of their walls, or they may become divided, each individual cell separating into different parts.

It is in these transitory cells, when applied to morbid anatomy, that the principal deviations from the theory of Schwann are observed. In instances of this class, it is frequently impossible to detect any cell-formations throughout the whole process of development; and if any be observed, it is a mere faint imitation or analogy. This is best observed in scrophulous and typhous exudations, and in a great part of the cases of tubercle. Here there is first an amorphous or finely granular exudation (*blastema*), forming a tenacious and rather firm mass, which by degrees is broken up into a more or less fluid magma, exhibiting under the microscope indefinite granular molecules of various forms and sizes, sometimes resembling cytoblasts and cells, but never indicating a decided cellular formation.

At the close of this chapter the author distinguishes morbid formations into homogeneous and heterogeneous, and into those which repair lost or injured parts, and tissues not reparative, but increasing directly the volume of organs previously normal,—the latter corresponding to hypertrophies and tumours.

The fifth chapter, ON THE SPECIAL RELATIONS OF PATHOLOGICAL EPIGENESES, is the most important of the whole volume; as in it the author gives a consecutive and comprehensive view of the whole series of morbid epigeneses, or additional formations. Of these our limits permit us to give only the names in their order. I. Purulent matter, true and spurious. II. Solid Pathological Epigeneses. III. Epigeneses of imperfectly organized structures. IV. Epigenesis of areolar or cellular tissue. V. Epigenesis of blood and blood-vessels. VI. Epigenesis of epithelium and epidermis. VII. Granulations. VIII. Epigenesis of fat and adipose tissue. IX. Epigenesis of muscular tissue, a. striated, b. non-striated. X. Epigenesis of elastic tissue. XI. Epigenesis of granular pigment—melanosis. XII. Epigenesis of nervous tissue. XIII. Epigenesis of cartilaginous and osseous tissues. XIV. Tumours,—vascular, fatty, fibrous, cartilaginous, osseous, melanotic, gelatinous, and encysted. XV. Malignant heterologous tumours or pseudo-plasmata; 1st class, nonorganized, embracing typhous, scrofulous, and tubercular deposits; 2d class, more organized,—containing cancer of different forms and polypi, and fungoid growths. XVI. Concretions;—class A, Concretions in the fluid secretions; 1. urinary, 2. salivary, 3. lacrymal, 4. concretions in the nostrils, throat, tonsils, and *bronchi*, 5. pancreatic calculi, 6. gall stones, 7. intestinal concretions, 8. concretions in the cutaneous glands; Class B. concretions in the parenchyma of organs.

The examination of these subjects occupies 256 pages, and is performed in a masterly and instructive manner.

In the sixth chapter, the author considers the pathological changes which take place in the physical properties of the tissues and organs of the body, namely, changes in colour, in figure and size, and in consistence.

The seventh chapter is devoted to the combinations of morbid elementary changes, including venous *hyperaemia* and serous dropsy in one order, and capillary *hyperaemia* and fibrinous dropsy or inflammation in another.

The eighth chapter is devoted to the subject of INDEPENDENT ORGANISMS IN THE HUMAN BODY, that is, PARASITICAL ANIMALS. After a general introduction on the nature of parasites, the question of equivocal generation, and the relations of parasites to disease, the natural history and pathological consideration of these creatures is treated in the following order:—First, Parasites derived from the Vegetable Kingdom, the *Epiphyta*, embracing the various tribes of *Fungi*; Secondly, Parasitic Animals, distinguished into Infusoria, Insects, Arachnida, and Worms, the last of which are subdivided into four orders after the manner of Rudolphi and Bremser,—*Nematoidea*, *Trematoda*, *Cestoidea*, and *Cystica*. The chapter is closed with a short discussion on Pseudoparasites.

Next comes, in chapter ninth, the subject of congenital deviations and imperfections, including malformations.

Last of all, the author considers, in the tenth and concluding chapter, the subject of the changes of the body after death, or those cadaveric phenomena which are either liable to be mistaken for the effects of disease, and thereby may obscure any question arising as to the exact cause of death, or which may become important by their bearing on medico-legal inquiries.

Our limits do not allow us to present a formal and detailed analysis of the contents of this work. The foregoing account, however, will inform the reader what he may expect to find in the volume. It is proper to say that all the subjects are treated with great ability, and illustrated with much accurate information; and that the work presents a just and very useful view of the present state of knowledge on the subject of general pathological anatomy.

Justice requires us to add, that the English reader is greatly indebted to Dr Day for introducing to his knowledge a work containing so much useful instruction, and so well qualified, by its philosophical character, to train him in the proper mode of studying the characters and effects of disease in the animal body.

ART. II.—*A Dispensatory; or Commentary on the Pharmacopœias of Great Britain; comprising the Natural History, Description, Chemistry, Pharmacy, Actions, Uses, and Doses of the Articles of the Materia Medica.* By ROBERT CHRISTISON, M.D., V.P.R.S.E.; President of the Royal College of Physicians of Edinburgh; Professor of Materia Medica in the University of Edinburgh; and Ordinary Physician to the

Queen for Scotland. Second Edition, Revised and Improved with a Supplement containing the most important New Remedies. Edinburgh, 1848. 8vo, pp. 1004.

During the six years which have elapsed since the first edition of this useful work was published in 1842, several important additions have been made to our knowledge of pharmacology and pharmacy. Various new articles have been added to the lists of the Materia Medica. Various processes for the preparation of medicines have been rectified and improved. New forms of administration have been proposed and introduced; new combinations of simples have been recommended; and, in some instances, improved modes of preparing and compounding the medicines recommended by the different Pharmacopœias have been devised.

The changes thus introduced during the period specified have rendered necessary corresponding changes in the treatises destined to guide the prescriber, and the druggist and compounder. In the present edition of this useful work accordingly, all these changes, additions, and rectifications have been introduced by the author with his usual skill and accuracy; and the treatise has been accommodated to the present state of pharmacological knowledge with much judgment.

It comes not within our plan to enter into minute or detailed criticism of a work like the present. Its merits as a treatise on materia medica, chemical pharmacy, and pharmacology, we, on a former occasion explained.* It is sufficient to say that the reader will find the character given in that article most ably sustained by the present edition. The natural and chemical history of the articles is given with great clearness and accuracy. The important subject of adulterations and sophistications is throughout treated with detail. The pharmacological instructions show very great practical experience and knowledge, which can be obtained by experience alone. And lastly, the therapeutic directions are expounded in a judicious manner, avoiding the extremes of great confidence and unreasonable skepticism. In short, the work may be justly recommended as an excellent treatise on Materia Medica, Chemical Pharmacy, and Pharmacology.

In the Supplement is given an account of the chemical history, pharmacological properties, and therapeutic applications of the following newly-introduced medicines,—gallic acid, Mr Donovan's liquid, namely, solution of iodide of arsenic and mercury, iodide of arsenic, sulphate of bebeerine, Carrara marble water, Indian hemp, chloroform, citrate of ammonia and iron, tartrate of ammonia and iron, citrate of iron and lactate of iron, matico, cod liver oil, amorphous quinine, pyroxylic spirit, iodide of sulphur, chloride of zinc, and valerianate of zinc.

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* Edinburgh Medical and Surgical Journal, vol. lvii. p. 101. Edinburgh, 1842.

Art. III.—*Gray's Supplement to the Pharmacopœia: Being a Concise but Comprehensive Dispensatory, and Manual of Facts and Formulæ, for the Chemist and Druggist and Medical Practitioner.* By Theophilus Redwood, Professor of Chemistry and Pharmacy to the Pharmaceutical Society of Great Britain. Second Edition. London, 1848. 8vo, pp. 1070.

Thirty years have elapsed, since the Supplement to the Pharmacopœia, by Samuel Frederic Gray, has been before the public; the first edition of that work having been published in 1818. Though a work of no scientific pretensions, and proposing rather to guide the trading and compounding chemist and druggist than the medical practitioner, it in no long time acquired a firm hold of public estimation. In nine years it had gone through three editions; and the fourth edition appeared in March 1828,—unequivocal proofs of its popularity. A fifth edition, apparently not by Mr Gray, appeared in December 1830; and in this, perhaps the first decided attempt was made to elevate the work above the moderate pretensions originally maintained by the author.*

The great object of Samuel Frederic Gray, in his first edition, appears to have been chiefly to provide for the trading chemist and druggist a safe and useful guide in his commercial transactions and manufacturing processes. Mr Gray undertook to instruct the druggist not only in the preparation and composition of medicines, their characters and qualities when genuine, and their commercial value; but to enable him to prepare various liqueurs and compounds; to manufacture yeast; to bake bread; to pickle and preserve meat; to make paint and varnishes, cements, and different kinds of glue; to compound shoe-blacking; to prepare cosmetics and perfumes; to understand the composition of patent and secret medicines, and even to prepare those required for the treatment of the diseases of horses, cattle, and other domestic animals. It is, in fact, difficult to imagine what an immense amount of information on various humble but useful processes Mr Gray contrived to communicate; and as the utility of all this was obvious and undeniable, however undignified it might seem to various persons, so we believe, that to this circumstance of extensive though humble usefulness must be ascribed the secret of the great success of the work of Mr Gray.

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* A Supplement to the Pharmacopœia, and Treatise on Pharmacology in General; including not only the Drugs and Preparations used by Practitioners of Medicine, but also most of those employed in the Chemical Arts: together with a Collection of the most useful Medical Formulæ, Veterinary Drugs, Patent Medicines, and other Compounds; an explanation of the Contractions used by Physicians and Druggists; and also a very Copious Index, English and Latin, of the various Names by which the Articles have been known at different periods: being a complete Dispensatory and Book of Formulæ for constant reference in Medicinal and Veterinary Practice, and Manual for Retail Druggists. The Fifth Edition, greatly enlarged, including the new French Medicines, and Selections from Foreign Pharmacopœias, &c. By Samuel Frederic Gray, Lecturer on the Materia Medica, Pharmaceutical Chemistry, and Botany. London, 1831. 8vo.

The Supplement to the Pharmacopœia continued to possess the appearance of 1830, with periodical improvements, until 1847, when a considerable change in its appearance, and great changes in internal composition,—changes still greater and more decided than that of the edition of 1830,—took place. In that year, Mr Theophilus Redwood published an edition of the work, in which he introduced so many changes, and so much new matter, that the work was anew denominated the first edition. In this treatise, which was nearly written anew, Mr Redwood removed the prefatory history of the former editions, substituting in its place a chronological account of the various Dispensatories and Pharmacopœias, that have been published at different times in different countries; enlarged, improved, and rectified the tables of weights and measures, specific gravities, and thermometrical equivalents; introduced a full and accurate, though short, natural history list of the articles employed in the three British Dispensatories, and also those used as occasional remedies in popular practice; and gave a complete system of formulæ, not only for the composition of the preparations authorized by the British Pharmacopœias, but for the preparation of artificial mineral waters, patent and secret medicines; directions and formulæ for the composition of paints, cements, cosmetics, perfumes, liqueurs, and many articles used either in the arts or for domestic purposes.

The success of this improved edition of the Supplement appears to have been great. The work appeared in its new form in February 1847, and a second edition was published in March 1848.

This second edition is the work now before us; and we think that it is entitled to be mentioned in favourable terms, as a useful guide to the prescriber, the apothecary, and the chemist and druggist, and as a repository of much useful and curious information. When, indeed, we compare the present edition of the Supplement with any of those which appeared during the lifetime of the author,—even the edition of 1830, which was the fifth,—the superiority is obvious and remarkable.

The work in its present form contains the following divisions. First comes a short chronological history of Pharmacopœias and Dispensatories, including those published in the different countries of Europe, and several of those which have appeared in the United States. Then follow Tables of Weights and Measures used in different countries, with tables for homologating the same. Next, Tables of Specific Gravities, instruments used for ascertaining them, with tables of hydrometrical equivalents, and of the relations between specific gravities and the strengths of acid and alkaline solutions. Then Thermometrical Scales and Equivalents; Chemical Elements and Symbols; a Table of the Solubility of Salts; and an Explanation of the Latin Terms used in prescriptions. The last we have reason to believe of very great use to a large proportion of her Majesty's subjects engaged in compounding and dispensing medicines, and perhaps not a few of those engaged in prescribing.*

This is followed by a pharmaceutical calendar, containing notices of plants to be collected and operations to be performed by the herbalist and pharmacologist at particular periods of the year.

Next follows the Materia Medica part of the volume, which is arranged in the following order:—

First is placed a list of animals yielding products employed in medicine, domestic economy, and the arts, arranged according to the most correct and improved natural history classifications. This list is copious and comprehensive, embracing every animal the parts of which are used as food, as medicine, as clothing, as articles of luxury, necessity, or manufacturing operations.

This is immediately followed by a short account of the most effectual methods of preserving animal substances, with formulae for preparing the most approved preserving powders, pickling brines, and conserving compounds.

This is succeeded by the list of plants and vegetable substances yielding products employed in medicine, domestic economy, and the arts, arranged according to the method of Decandolle, with such modifications from Endlicher, Hooker, and Lindley as seem expedient. This list is like that of the animal substances, ample and copious, and embraces every plant employed in any mode either by physician, apothecary, artizan, or compounder. It occupies the largest portion of the volume, and is concluded by a short chapter of directions for the collection and preservation of plants and vegetable substances in general.

The fourth division of the work is the formulary, or arranged list of prescriptions for the preparation and composition of medicines according to the different Pharmacopœias. Here, however, the reader finds much more than this. He has directions for the preparation of artificial or imitated mineral waters, prescriptions for the composition of patent and secret medicines, veterinary medicines, perfumes and cosmetics, medicinal and aromatized cigars, different sorts of coffee, pigments of various kinds, cements, polishes,—in short, for preparing every article almost, either useful or ornamental, required in domestic economy.

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* There is one direction which cannot fail to be both amusing and attractive, from its great and indispensable importance in the dispensing of medicines. It consists in the letters *Ne tr. s. num.;* which characters explained are, *Ne tradas sine Nummo;* meaning in plain English what Adam Smith used to call, Pay and weigh, or, No Medicine without Cash.

The whole is concluded with a very ample and detailed index to facilitate réference and consultation.

From the foregoing account, it will be seen that this is a very useful publication. Omissions and faults it may contain; but these its merits greatly counterbalance. Besides, *de minimis non curat lex;* we never censure for trifles. The work furnishes much useful information, not only to the prescriber, the apothecary, and to the druggist, but to private individuals who are desirous to understand the method of preparing various articles required in daily use. To country clergymen, farmers, and persons resident in the country in general, it must be a very valuable companion.

ART. IV.—*A Manual of the Principles and Practice of Ophthalmic Medicine and Surgery.* By T. WHARTON JONES, F. R. S.; Lecturer on Anatomy, Physiology, and Pathology at the Charing Cross Hospital; Foreign Member of the Royal Medical Society of Copenhagen, &c. London, 1847. 12mo, pp. 570.

IF the great number of treatises of different degrees of merit on diseases of the eye, and the methods of treating those diseases, shows how much attention is now bestowed on ophthalmic medicine and surgery, this multiplicity of works tends in some degree to perplex the student in his choice.

The present treatise, from a well-informed anatomical and pathological observer, is strongly entitled to the attention of the student. Mr Wharton Jones has collected with great care and judgment, and combined with much skill, whatever is most valuable in the writings of his predecessors and contemporaries on the subject of ophthalmic diseases and the most effectual modes of treating them. The work accordingly presents, in a compendious form, a complete and correct view of the present state of ophthalmological science; and as such we recommend it strongly to the attention of professional readers.

PART III.

MEDICAL INTELLIGENCE.

ORGANIC CHEMISTRY AND APPLICATIONS.

On Gutta Percha, or Gum Gettanea, a new substance imported from Singapore. By Mr Solly and M. Soubeiran. (*Pharmaceutic Journal, et Journal de Pharmacie, 3ieme series T. 11ieme. Paris*, 1847, *Janvier.*) —A remarkable substance bearing the name of *Gutta Percha*, and in several respects analogous to caoutchouc, though in others very different from that article, was imported last year from Singapore, and attracted the attention of experimental inquirers. *Gutta Percha* was first sent in 1843 by Dr Montgomery, who received from the Society of Arts a gold medal as a reward for the introduction of this substance, which was considered capable of many useful applications in the arts. This gentleman appears not, however, to have made known anything of its history, unless that it could be obtained in very great quantities at moderate price, and that it was much used by the natives as a substitute for horn or wood in many instances, particularly in the manufacture of the handles of knives.

These several applications are the result of the property which this substance possesses of being softened by heat and becoming firm and hard on cooling, retaining at the same time the forms in which it has been moulded. In this respect it continues in a state of perfect preservation, and is subject to no rupture on wearing, to such a degree, that it is represented to be preferable to buffalo-horn in the uses in which this last substance is employed.

In the Journal of Agriculture of the India Society, Dr Mouat states, in his account of the chemical examination of this substance, that he obtained results analogous to those obtained in this country by Mr Solly. Dr Montgomery ascertained that *Gutta Percha*, or Gutta Tuban, according to the Malays, is produced by a large tree which grows at Singapore and the neighbouring districts. According to a note of Mr White, this tree appears to belong to the natural family of Sapotaceæ or Ebenaceæ. The trunk is straight and tall, about three feet in diameter at the base, with numerous branches. The timber is hard. The leaves are alternate, petiolated, oblong, slightly-pointed at the apex, conical at the base, from five to six inches long; the lower surface of brown-red, covered, as well as the sides and the petiole, with a thick down. The flower axillary, sessile, inserted by fours in a small white calyx, persistent, with six divisions, in double series, the external the larger.

The corolla monopetalous, six-fid; the lobes one-fourth of one inch, and the tubes one-eighth of one inch long; caducous.

Twelve stamens in one single series, equal, inserted at the opening of the tube. The filaments equal in length to the lobe of the corolla. The anthers sagittate, fixed by their basis to the filaments. Pollen not abundant. Ovary superior, conical, sessile, placed on a disk; six cells, each cell containing one single *ovulum* suspended by a central axis, filament well-marked.

The mode of preparing *Gutta Percha* is not known. It appears, nevertheless, that it is procured by felling the tree which produces it. It is probable that the sap is removed in layers in proportion as they dry, and that these layers are then united, so as to form solid masses.

The specimens sent to England are in two forms. One set have the appearance of shreds or cuttings of white leather; others of solid rolls, which being cut across, show the thin layers, the assemblage of which forms the entire mass.

These masses are far from being pure. A considerable quantity of wood sawings and other vegetable remains appears in the mass.

Gutta Percha is an opake white, or dirty white substance, with little or no odour, tasteless, insoluble in water. Its colour depends apparently on the presence of the impurities which it contains; for, when purified by hot water in the manner now to be described, the water acquires a coloured tint, while the substance becomes white or gray. It has a silky fibrous texture, which becomes more distinct when the mass is slightly stretched; it is soft, almost unctuous between the fingers, and at the same time it has great resistance.

At ordinary temperatures it is hard, leathery, and slightly flexible, when in thin plates, presenting the physical characters of horn. Above 50° it becomes more flexible, slightly elastic, but always retaining its hardness and remarkable resistance. It contracts little when it has been forcibly stretched.

At 65° and onward to 70°, this substance becomes soft and very plastic; its tenacity diminishes greatly. In this state several portions may be united with great facility so as to form one body. It is easily purified by immersing it in hot water, when the impurities are quickly and completely separated, and a solid mass of pure substance is obtained.

When crude *Gutta Percha* is thus softened in boiling water, or by exposure to heat, it may receive all the desired shapes; and by cooling it recovers its original hardness, preserving its figure; consequently it may be employed in forming casts of medals, which have all the perfection of those formed by sulphur, without the fragility of these last.

When the substance is hot, it may be easily cut by a knife; but when it becomes hard and cold, it gives great resistance even to the saw, like hard caoutchouc. The division of this substance becomes more easy, however, by using a wet instrument, as is done with caoutchouc.

Gutta Percha is much lighter than water. When it is carefully deprived of the water which it contains, it is still much lighter than water, but much denser than caoutchouc. Its specific gravity is 0.9791, while that of ordinary caoutchouc is 0.9355. When *Gutta Percha* is subjected for some time to a temperature of 150°, it disengages a small quantity of water, and loses its white aspect, becoming of a deep-gray colour, and translucent. It very soon recovers its original appearance if kept for a short time in hot water, and even in cold water.

In chemical characters it closely resembles caoutchouc, with which it is identical in composition. From this it differs slightly in the manner in which it is acted on by certain liquids, but it differs chiefly in physical properties. Subjected to distillation by fire, it is converted almost entirely into several volatile or gaseous hydro-carbonated substances, which possess almost the same odour and probably the same composition as the volatile oil of caoutchouc. It leaves a scanty carbonaceous residue.

Warmed in a platinum vessel, it melts, forms a sort of froth, and burns with a brilliant fuliginous flame, diffusing the odour of the oils of its distillation. When a fragment thus half-burnt is extinguished, the residue is altered, and changed into a viscid fluid.

The ordinary solvents exercise little or no action on *Gutta Percha.* Water, alkohol, alkaline solutions, the muriatic and acetic acids, have no effect on this body. Concentrated sulphuric acid gradually chars it. Nitric acid slowly oxydizes it, forming a yellow resinous matter. By ether, the volatile oils, oil of pit-coal, it is slowly softened in the cold, and imperfectly dissolved by the aid of heat. The true solvent appears to be oil of turpentine, which with great facility forms a clear colourless solution, from which the *Gutta Percha* may be separated by distillation of the solvent. It is also dissolved by chloroform and by naphtha.

Its physical properties appear to render *Gutta Percha* a very proper substitute for leather; for it is exempt from the inconveniences which prevent caoutchouc from being employed in this manner.

M. Soubeiran subjected to various experiments specimens of *Gutta Percha* received from the Minister of Commerce, and the following are the results:—

Gutta Percha imported by the China mission has the shape of a round loaf, a little flattened at the base. It looks at first sight as if it were enclosed in an investment of skin; but attentive examination shows that this exterior covering is only the substance itself in a highly-dried condition On cutting the leaf in two, we see that it is formed by a matter still soft which has been added at several distinct times, and the different portion of which form layers placed over each other. The consistence is tenacious, and in some degree membranous. The odour is that of old cheese, yet some of the odour of leather is also perceptible.

Gutta Percha, M. Soubeiran found, like Mr Solly, to become by heat soft, perfectly plastic, and convertible into all sorts of forms, which are retained with accuracy when the substance becomes cold and firm.

Gutta Percha contains chemically at least five different substances:—

1, Pure *Gutta Percha;* 2, a vegetable acid; 3, caseine; 4, a resin soluble in ether and in oil of turpentine; and 5, a resin soluble in alkohol.

The presence of caseine is indicated by the smell of spoiled cheese, which is possessed in a high degree by the article brought from China. This odour was not perceptible in a specimen sent M. Soubeiran from London by the kindness of Mr Calvert. The vegetable acid is found in the water in which the *Gutta Percha* has been boiled. Its quantity is very small; it is associated with a little brown extractive matter, which may proceed from the impurities mingled with the vegetable fluid.

Alkohol at 40° removes from *Gutta Percha* a transparent inodorous resin, a little soft, which is easily dissolved in oil of turpentine and in ether.

When, after several digestions in boiling alkohol, *Gutta Percha* was subjected to prolonged boiling with sulphuric ether in a proper apparatus, M. Soubeiran obtained from it a small quantity of a white yellowish resin, which is perfectly dissolved in sulphuric ether and oil of turpentine. This resin possesses in a high degree the smell of leather, and to this must be ascribed the leathery smell which is perceived in the raw *Gutta Percha* of commerce.

Gutta Percha, after these two processes by alkohol and ether, loses only a very minute portion of its weight. The substance then consists of a peculiar matter very analogous to caoutchouc, and which is pure *Gutta Percha.* To deprive it of the impurities which adhere to it, solution by rectified oil of turpentine answers best. The solution allowed to rest becomes quite limpid; and when decanted and precipitated by alkohol, the *Gutta Percha* is separated in a soft mass, which preserves all its properties after it has been several times washed in boiling alkohol. In this state it may be dried in a stove; and M. Soubeiran kept it in a stove heated to 100°, where it was softened.

Subjected to definite analysis in a long tube, with a mixture of chlorate of potass and oxide of copper,—after three analytical processes the following results were obtained—

Carbon, 83·5	Water, 11·3
83·5	11·6
83·4	11·5

As it was ascertained that the matter left no traces of cinder, it follows that it contained a little oxygen. This M. Soubeiran ascribes to the impossibility of separating completely the *Gutta Percha* from the two resins with which it is associated.

The composition of *Gutta Percha*, calculated on the results of the foregoing analysis, is—

Carbon,	12 parts,	87·8
Hydrogen,	20	12·2

which approaches very closely to the composition of caoutchouc, in which Faraday found

Carbon,	87·2
Hydrogen,	12·8

M. Soubeiran states that he is inclined to believe in the identity of these two substances, though analysis does not pronounce in a positive manner.

Gutta Percha he, nevertheless, admits, is very distinct from caoutchouc as an immediate principle. Its physical properties enable it to perform in industry and the arts, an important part;—the manufacture of whips, impermeable or waterproof soles to boots and shoes, handles of tools and instruments, and a multitude of domestic utensils. It is further a peculiar character of this material, that all articles made from it will be at the same time resisting and in some degree durable; and when they are once unserviceable in their present form, they require merely to be immersed in hot water in order to refit them, or to make them serve in a new form.

Hats manufactured of this substance have been recently announced in London. It is well calculated for making bougies, catheters, probangs, and œsophagus and laryngotomy and lithotomy tubes.

ORGANIC CHEMISTRY AND PHYSIOLOGY.

On the part performed by Saliva in Digestion. By M. Cl. Bernard, (Archives de Medecine, January 1847).—In 1831 Leuch first remarked, that human saliva in contact with starch, hydrated hot, possesses the property of transforming the starch into glucose or into dextrine.

Sebastian, Schwann, and other experimentalists repeated the experiment, of which M. Mialhe endeavoured to give the chemical explanation. This chemist has announced the opinion, that the saliva owes its property of converting starch into sugar to this circumstance, that it contains a peculiar principle separable by alkohol and analogous in its characters to vegetable diastase. Hence M. Mialhe applies to the active principle of the saliva, the name of *salivary diastase.*

Shortly after M. Lassaigne ascertained, that pure parotid saliva exerts no action on crude fecula, MM. Magendie and Rayer very soon after published the statement, in giving an account of the labours of an academical commission, that mixed saliva, or the fluid contained in the buccal cavity of the horse, converts, as in man, crude starch into dextrine or into glucose.

From these researches then it appeared to result, that the parotid saliva having no effect upon starch, mixed saliva, the result of the union of the fluids secreted by the other buccal glands (the sublingual, submaxillary, and the glandules), possessing properties diametrically opposite, that is converting invariably starch hydrated hot into glucose, or into dextrine, the seat of the salivary diastase, ought to be, excluding the parotid gland, in one of the three last glandular organs specified.

M. Bernard has multiplied his experimental researches with the view of verifying this hypothesis; and he has obtained the following results.

First series of experiments.—In operating on dogs, M. Bernard ascertained that the mixed saliva of this animal converts starch, but that the parotid, sublingual, and submaxillary forms of saliva taken separately out of the mouth before their entrance into this cavity, have no action on starch.

Second series of experiments.—If the salivary diastase has no existence in any of the liquids which form mixed saliva, before their arrival in the mouth, it must then be in the parietes of this cavity that this mysterious principle is contained. By reasoning in this manner M. Bernard has ascertained, that salivary diastase is the result of the action exercised by the saliva on the mucous membrane of the mouth. It is a species of fermentation which appears to be easily developed in all the mucous membranes, and which is analogous to the lactic fermentation so carefully studied by MM. Boutron and Fremy. But the action of this salivary ferment on starch is indeed of small importance as to digestion in man, the horse, the dog; for it requires a long time for the mixed saliva to accomplish the saccharine fermentation, so that the latter can scarcely be commenced during mastication and deglutition. Now, when the saliva has arrived at the stomach, which contains an acid fluid, it immediately loses its diluent properties in consequence of the combination of its alkali with the gastric acid. This amounts to saying that the chemical part of the saliva in digestion is almost null.

The third series of experiments undertaken by M. Bernard, shows that deglutition without saliva is very slow and very difficult, and that almost the sole purpose of this fluid is to favour the accomplishment of the physico-digestive processes,—mastication and deglutition.

Normal Presence of Sugar in the Blood. By M. MAGENDIE. (*Comptes Rendus, September* 1846, *et Journal de Pharmacie.*)—It has been known since 1837 that sugar existed in the blood of persons labouring under diabetes, and could be obtained from that liquid. M. Magendie has recently undertaken to prove that saccharine matter is found in the blood of animals in a state of health. A fact now admitted is, that saliva, gastric fluid, and pancreatic fluid have the property, by their contact, of converting starch into glycose or grape sugar and dextrine. It was first ascertained by Bouchardat and Sandras, that the pancreatic fluid exerts a particular energy in digesting or assimilating all amylaceous or starchy articles of food. M. Magendie has ascertained that this catalytic property belongs not exclusively to the saliva, gastric, and pancreatic fluids. It belongs also to all the liquids of the animal economy, such as bile, uric acid, semen, &c. On infusing separately, in water heated to 40°, portions of brain, heart, lung, &c., M. Magendie found that these infusions, filtrated warm, unquestionably convert starch into sugar. The serum of the blood and the blood itself possess the same remarkable faculty.

Living blood in circulation has the same prerogative. M. Magendie having examined the blood of a rabbit into a vein of which he had injected some paste, found in it no longer any trace of this substance, and ascertained on the other hand the presence of an increasing quantity of glucose. Five hours after the operation, the proportion of sugar was at its maximum: seven hours after, no trace of it remained.

The introduction of starch into the veins being beyond the regular phenomena of life, M. Magendie wished to know if the blood of a dog, fed exclusively on substances strongly amylaceous, contained sugar. With this view, he fed for several days one of these animals with baked potatoes, and as soon as the urine of the animal became alkaline, turbid, without urea, he examined the blood and found in it a notable proportion of glucose, and of a matter probably identical with dextrine. The urine of the dog contained no sugar. It hence appears that sugar may exist in the blood without appearing in the urine.

M. Magendie in like manner established the presence of sugar and dextrine in the blood of horses fed exclusively on oats, although their urine was acid, clear, and contained urea.

This physiologist regards it as highly probable that during the digestion of amylaceous articles of food, the blood contains sugar. This substance has been several times recognised in the blood of diabetic patients. But the presence of glucose in the blood was regarded as a morbid effect; while there is every reason to believe that it is on the other hand a natural consequence of the digestion of starch, or of its absorption by the intestinal veins.

Report on the Mortality of Edinburgh and Leith for the months of January, February, March, April, and May 1848. By James Stark, M. D., Fellow of the Royal College of Physicians of Edinburgh.—The mortality of Edinburgh during the past five months of this year amounted to 2519—1265 being males, 1119 females, and 135 still-born. The mortality of the corresponding months during the years 1845, 46, and 47, was respectively 1684, 1967, and 2560.

The mortality of Leith during the first five months of 1848 amounted to 458—193 being males, 237 females, and 28 still-born. The mortality of the corresponding months during the years 1845, 46, and 47, was respectively 226, 302, and 456.

The mean temperature of the above-named five months was, for January 33°.48, for February 39°.60, for March 41°.19, for April 48°.31, and for May 54°.58. The range of temperature was greatest in January, amounting to 49 degrees Fahr., and least in March, when it amounted to 35 degrees only. Thus the range of temperature in January was from 5 to 54 degrees, in February from 15 to 57, in March from 26 to 61, in April from 26 to 65, and in May from 35 to 78 degrees.

The quantity of rain which fell during January amounted to 1.26 inches, in February to 5.21 inches, in March to 2.80 inches, in April to 1.06 inches, and in May to 0.60 inches, being altogether 3.43 inches more than the fall of rain during the corresponding months of 1847.

During January west winds blew 20, east 9½ days. During February west and south-west blew 23½ days, east 5½ days. During March west, north-west, and south-west winds, blew 14 days; east, north-east, and south-east, 17 days. During April east, north-east, and south-east blew 18 days; west, north-west, and south-west 10 days. During May west and south-west blew 19½ days; east and south-east 11 days.

The barometer showed its greatest range during February, when it amounted to 2 inches; its least range in April, when it amounted to only 0.84 of an inch. The mean pressure of the atmosphere was lowest in February, being 29.06 inches, and highest in May, when the mean height of the column of mercury was 29.75 inches. It may be mentioned, that the mean height of the barometer for the last three years at Canaan Cottage, where the meteorological registers are kept, was 29.55 inches. The absolute greatest pressure of the atmosphere during the last five months occurred on the 24th of January, when the mercury rose to 30.20 inches, and the absolute lowest pressure on the 28th day of February, when the column of mercury descended to 28.10 inches.

From the above statement of the mortality it will be seen, that the total mortality of the first five months of this year was very nearly equal to that of the first five months of 1847, during which the mortality in Edinburgh was higher than it had ever previously been. The high mortality of the past months, however, chiefly occurred during January, February, and March, having been highest in January, and having steadily fallen till it almost attained its natural standard in May. Thus, during January the deaths (excluding still-births) amounted to 616, being at the rate of 19.8 deaths daily. During February the deaths numbered 542, being at the rate of 18.6 daily. During March the deaths amounted to 470, being at the rate of 15.1 daily. During April the deaths were 391, or were at the rate of 13.0 daily. While during May the deaths fell to 365, being at the rate of only 11.7 deaths daily. The deaths during May were thus merely a fraction above the mean daily mortality of the last seven years—excluding last year, during which, from particular causes, the mortality registered in Edinburgh was excessive. There has thus been a steady and progressive diminution in the mortality of Edinburgh since the 30th day of November 1847, on which day, from causes already explained in former reports, the mortality reached the frightful height of 61 deaths, instead of 11, the usual daily average.

As no means as yet exist of ascertaining the number of deaths in the chief towns of Scotland, it may not be uninteresting to compare the ratio of mortality here with that of a few of the chief towns of England, for the first quarter of the present year. The calculations as to the English towns are made from the Registrar-General's report of the mortality of the principal towns of England for the first quarter of 1848.

The following table exhibits the absolute and proportional mortality of the several places mentioned, during the first quarters of the years 1846, 47, and 48, with the ratio of increase or decrease in the mortality during 1848, as compared with the mortality of the two previous years. As the year 1846 may be considered a year of medium mortality, the towns are arranged in the order of least increase as compared with that year.

Table I.—Proportional Mortality of different Towns during the First Quarter (ending 31st March) of the years 1846, 47, and 48.

Places.	Mortality of First Quarter, 1846.	Mortality of First Quarter, 1847.	Mortality of First Quarter, 1848.	Increase per cent. in 1848 above the mortality of 1846.	Percentage of Mortality in 1848 with that of 1847.
1. Carlisle,	248	340	294	18.5	— 15.6
2. London,	12,518	15,289	16,455	31.3	+ 7.6
3. England and Wales 117 districts,	43,850	56,105	57,710	31.6	+ 2.8
4. Edinburgh,	1,210	1,403	1,628	34.5	+ 15.3
5. Manchester,	1,527	2,185	2,079	35.4	— 5.1
6. Wolverhampton,	574	769	831	44.9	+ 6.7
7. Liverpool,	1,934	3,068	2,934	51.0	— 4.5
8. Leith,	163	280	267	63.8	— 1.4
9. Birmingham,	876	1,187	1,660	89.4	+ 39.8

Note.—The + mark in the last column denotes that the mortality of 1848 was greater than that of 1847 by the amount noted. The — mark denotes that it was less.

This table shows that, as compared with the standard of 1846, the mortality in Edinburgh during the first quarter of 1848 has been little beyond that of London, while it has been lower than that of Manchester, Wolverhampton, Liverpool, Leith, and Birmingham.

During the months of April and May the mortality of Edinburgh and Leith was the following, during the years 1845, 1846, 1847, and 1848.

	1845.	1846.	1847.	1848.
Edinburgh, ...	572	734	1009	756
Leith, ...	59	111	143	163

From this it will be seen that while the mortality of Edinburgh is rapidly falling to its natural standard, that of Leith continues on the increase.

The mortality of the present year has been chiefly kept up at its high rate by the prevalence of epidemic typhus fever. This fever raised the proportionate mortality of zymotic diseases (*i. e.* epidemic and contagious diseases) from 20 per cent. of the total mortality, which is about the average in Edinburgh, to 51 per cent. in December last. From the opening of the year, however, the proportional mortality from the zymotic diseases has fallen in Edinburgh from 47 per cent. of the total mortality, which was the proportion for January, to 32 per cent., the proportion for May; and as the fall has been steady and progressive, we have the prospect of seeing the mortality of this class of diseases speedily reduced to its normal proportion. In Leith, however, which was not exposed to the same aggravating causes as Edinburgh, the mortality of the zymotic diseases during the past months of this year amounted only to 28 per cent. of the total deaths, falling slowly but steadily from 34 per cent. in January, to 22 per cent. of the total mortality in May.

Of the zymotic diseases, typhus fever has been by far the most prevalent. In Edinburgh the deaths therefrom constituted no less than 72 per cent. of the mortality of the class of zymotic diseases, while in Leith they only amounted to 55 per cent. of the same class of diseases. Or, to compare the proportion of deaths from typhus fever with the total mortality, while in Edinburgh the deaths from that fever constituted 28 per cent. of the total mortality, in Leith they were in the proportion of 16 per cent. only. During the above five months 707 persons died from typhus fever in Edinburgh, of whom 432 were males, and only 275 females. In Leith 69 died from typhus fever, of whom 32 were males, and 37 females; thus adding another fact to those already noted in former reports of the different proportion of the sexes falling victims to this disease in places where the fever is to a certain extent kept up by importation, from those in which it solely depends on endemic and epidemic causes.

Of the 31 deaths in Edinburgh, and 3 in Leith, from small-pox, only 3 were reported to have been previously vaccinated. As connected with this disease, it may be mentioned that in several parts of Scotland, where small-pox is at present raging as an epidemic, cow-pox is at the same time prevailing among the cattle; thus showing the close analogy, if not the actual identity of the two diseases.

Measles and hooping-cough, the usual fatal epidemics of children, have been unusually rare during the past months of this year. Scarlet fever, however, has taken their place, and been more prevalent than it has been for several years. In general the epidemic has been mild, but 50 cases in Edinburgh have proved fatal, 25 being males, and 25 females. In Leith also scarlet fever has been unusually prevalent, causing there 16 deaths, 10 being males, and 6 females. It has often been remarked that while one epidemic is raging others are in abeyance. In so far as the epidemics of children are concerned, this has been the case in Edinburgh. In the winter 1835–36, when scarlatina raged to a greater extent than has since been noticed, measles and hooping-cough were exceedingly rare; and the same circumstance was observed during the present epidemic of scarlatina. On the other hand, when measles and hooping-cough were prevalent, scarlet fever has been rare, as was the case in the years 1846–47.

The mortality from influenza has progressively diminished from January, when the deaths therefrom were 26, till April, when they numbered two only. No deaths from that cause were registered during May.

Diseases of the brain were more numerous, and their fatality greater, during the balmy and genial month of May, with its mean temperature of 54.58 degrees, than during any other month of the past year—a fact still more remarkable when compared with the total mortality of each month. Thus during January the deaths from diseases of the brain were in the proportion of 5.3 to the 100 deaths from all causes. In February they were in the proportion of 6.0 to the 100 deaths. In March as 7.4 to the 100 deaths. In April as 7.6 to the 100 deaths. But in May the deaths from diseases of the brain increased to the proportion of 11.3 to the 100 deaths from all causes; thus apparently proving that the fatality of brain diseases is greater in hot than in cold weather.

Diseases of the respiratory organs were most fatal during the inclement month of January, and least fatal during the balmy month of May. Including croup and influenza, 131 deaths from diseases of the respiratory organs occurred in January, only 74 from the same causes in May. It has often been remarked that consumption is most fatal during the spring months, and the published observations of Casper and others seem to prove the fact. The Edinburgh Mortality Tables bear out this remark, and the following table will show that the mortality from consumption during the spring quarter of the two past years is higher than that of any other quarter of those years.

Quarters of Year.	Deaths from Consumption in 1846.	Deaths from Consumption in 1847.
1st or Winter Quarter,	157	193
2d or Spring Quarter,	166	210
3d or Summer Quarter,	159	194
4th or Autumn Quarter,	157	194

If reckoned by months, however, it appears that a nearly equal mortality from consumption occurs during the coldest or most inclement month, as during the first balmy month of the year. Thus in 1846 the greatest number of deaths from consumption occurred during the months of December and of May, during each of which 67 deaths occurred. In 1847, again, the greatest number of deaths from that disease occurred during December, when 83 died; but during April of that year 82 deaths were recorded. During the past months of this year the deaths from consumption were most numerous during March, and next most numerous during January.

The mortality from diseases of the heart and blood-vessels during the past months was greatest during the months of March and May, but no conclusion could be founded on this circumstance, seeing that during last year an equal mortality from heart disease occurred during the spring and autumn quarters, while in 1846 the fatality of these diseases was least during spring.

Inflammatory affections of the bowels were most common during the month of January, and gradually diminished in frequency till the end of May. The same remark was this year applicable to the mortality of all affections of the organs of digestion.

The deaths registered under the head of old age were most numerous during January—cold ungenial weather being especially noxious to the aged.

Still-births in Edinburgh were more numerous during May than during any previous month of the present year. While only 19 still-births took place during each of the months of April and May, their numbers suddenly increased to 34 during the month of May.

The following is an abstract of the Edinburgh and Leith Mortality Tables for the months of January, February, March, April, and May 1848, classified according to ages and diseases.

TABLE OF AGES. January 1st to May 31st 1848.

AGES.	EDINBURGH.										LEITH.									
	January.		February.		March.		April.		May.		January.		February.		March.		April.		May.	
	M	F.	M	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Still-born, . .	18	13	18	14	13	6	18	6	18	16	6	3	3	5	2	2	2	1	2	2
1 year and under,	35	33	53	24	28	23	25	16	32	21	4	10	3	2	8	4	7	6	8	2
2	12	21	28	14	13	14	11	13	15	9	3	4	5	8	4	3	3	6	3	5
5	21	19	10	13	13	20	19	14	16	17	2	4	5	2	4	2	3	3	3	3
10	17	7	10	14	8	13	6	9	8	7	0	0	2	4	2	3	4	1	1	2
15	8	2	11	4	3	7	8	3	3	6	1	1	2	1	0	2	0	0	1	1
20	13	12	13	9	18	2	21	10	9	7	3	2	1	1	1	2	2	1	1	2
30	40	31	45	35	37	28	25	21	21	14	3	3	6	0	3	4	2	7	1	4
40	50	21	30	32	43	24	22	30	21	17	3	4	7	9	2	7	5	4	2	3
50	50	34	24	27	32	22	25	26	23	17	7	2	3	7	3	4	4	6	4	2
60	31	33	34	23	18	16	13	11	22	21	4	1	3	3	4	5	3	1	6	7
70	18	34	15	22	12	26	14	14	10	13	5	9	2	1	2	4	2	6	1	3
80	19	22	13	17	11	22	9	16	6	11	6	11	1	7	2	1	0	2	3	1
90	7	10	6	6	5	7	0	8	6	5	1	2	1	3	0	0	1	5	0	4
100	0	4	1	2	0	1	0	2	1	1	0	0	0	0	0	1	0	0	0	0
103	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Not stated, .	9	3	5	2	1	2	0	0	4	2	0	0	0	2	1	3	3	1	1	1
Total, .	348	299	316	258	255	234	211	199	215	184	48	56	44	55	38	47	41	50	37	42
	647		574		489		410		399		104		99		85		91		79	

CLASSIFIED TABLE OF DISEASES. Jan. 1st to May 31st 1848.

Class.	Diseases.	Edinburgh.					Leith.				
		Jan.	Feb.	Mar.	Ap.	May	Jan.	Feb.	Mar.	Ap.	May.
I.	Small-pox, .	6	3	4	7	11	2	...	...	...	1
	Measles, . .	3	5	4	3	3	1	3	...	1	1
	Scarlet fever, .	13	9	9	9	10	1	6	3	5	1
	Hooping-cough, .	15	8	10	3	8	...	...	1	1	1
	Croup, .	8	4	7	3	5	...	3	4	1	1
	Diarrhœa, .	2	6	8	8	8	...	1	...	...	...
	Influenza, .	26	10	3	2	...	7	...	1	...	...
	Typhus fever, .	209	201	128	102	67	20	20	8	10	11
	Erysipelas, .	6	4	3	4	2	2	2	1	2	...
	Other zymotic diseases,	1	5	3	2	4	...	1	...	...	1
II.	Dropsy, . .	14	9	12	18	13	1	3	1	2	1
	Cancer, .	...	1	1	...	3	2	...	...	4	1
	Debility, . .	16	25	8	9	13	3	1	3	4	1
	Sudden deaths,	1	4	2	2	1	1	1	3	...	...
	Other dis. of uncert. seat,	1	5	8	11	8	1	1	3	2	2
III.	Cephalitis, .	4	4	4	1	3	...	...	...	...	...
	Hydrocephalus,	4	13	11	8	13	1	2	4	2	2
	Apoplexy, .	12	3	4	9	6	2	...	...	1	1
	Paralysis, .	7	8	9	6	4	2	2	2	...	...
	Convulsions, .	2	3	2	2	3	1	1	...	...	...
	Other diseases of brain,	4	2	5	4	8	2	...	1	1	1
IV.	Pneumonia, .	12	17	12	17	9	3	1	1	4	3
	Asthma, .	14	10	9	3	6	2	1	2	...	1
	Consumption, .	57	42	58	54	47	10	9	14	14	17
	Other dis. of resp. organs,	14	12	7	6	7	2	3	2	2	...
V.	Dis. of heart & blood-ves.	7	6	8	6	8	...	...	1	3	1
VI.	Teething, .	12	12	16	8	6	...	3	...	2	2
	Inflammation of bowels,	32	24	18	19	14	5	7	9	4	5
	Tabes mesenterica,	9	20	9	9	10	2	1	2	3	3
	Other dis. of org. of digest.	11	5	9	4	5	1	2	2	...	1
VII.	Kidney and urinary dis.	2	...	...	4	1	...	2	...	...	...
VIII.	Child-birth, .	7	7	7	8	2	1	...	2	2	...
	Dis. of uterus, ovaries, &c.	1	1	4	...	...	1	...	...	...	1
IX.	Rheumatism, .	1	2	...	2	...	...	...	...	...	...
	Spine, joint, and bone dis.	1	1	1	1	1	...	...	...	...	...
X.	Ulcer, fistula, & skin dis.	1	1	...	...	...	...	...	1	...	...
XI.	Old age, . .	57	37	46	28	31	17	13	4	11	11
XII.	Intemperance .	...	...	...	...	1	...	...	...	...	1
	Violent deaths & suicides,	10	5	12	6	15	2	1	3	3	1
	Causes not specified,	14	8	9	3	9	...	1	2	4	2
	Total deaths,	616	542	470	391	365	95	91	81	88	75
XIII.	Still-born, .	31	32	19	19	34	9	8	4	3	4
	Total,	647	574	489	410	399	104	99	85	91	79

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PART I.

ORIGINAL COMMUNICATIONS.

Art. I.—*Observations on the Characters of Endemic Fever in the Island of Dominica; preceded by an Account of the Physical Peculiarities of the Island so far as they influence the Formation and Intensity of Disease.* By John Imray, M.D., Licentiate of the Royal College of Surgeons, Edinburgh, Resident Physician at Roseau.

As the nature of endemic diseases depends so much upon the physical characters of the country in which they originate, it may not be considered inappropriate to give a slight topographical sketch of this island before proceeding to the consideration of some of its endemic fevers.

The island of Dominica, in lat. 15° 18′ N., and long. 61° 28 W., lies between the two French colonies of Martinique and Guadaloupe, and is about 29 miles in length, and 16 in breadth. Viewed from the sea, the island has a singularly bold and magnificent appearance. A dark, irregular mass of lofty mountains rises abruptly from the ocean, as if suddenly upheaved from the deep by some mighty convulsion of nature. The rugged grandeur of the island is softened on a nearer approach by the mantle of green that everywhere covers its surface, from the sea margin to the tops of the highest mountains. In sailing along the coast, the smiling valleys, deep ravines with overhanging cliffs, and lofty wooded mountains, form a succession of views of exceeding beauty and magnificence.

The coasts of the island, for most part bold and rocky, are here and there indented by deep bays. On the windward side, high ranges of cliffs, broken at intervals by ravines and valleys, rise precipitously from the water's edge.

The European visitor is struck with the luxuriance of vegetation that everywhere meets his eye. Not only are the precipices fringed with trees and shrubs, but along the face of the cliffs are seen growing many different kinds of plants; and even trees are observed shooting as it were from the bare rock, and sending out their roots in all directions in search of rents and crevices, into which they dive for the purpose of finding nourishment. Wherever, indeed, the smallest portion of soil can collect, there some form of vegetable life is met with.

The highest range of mountains runs in the centre of the island in the direction of north to south. From this, smaller ranges of mountains pass down to the coast on each side, being intersected by valleys and deep ravines, narrow and winding at first, but opening out towards the coast.

The formation of the island is volcanic. The cliffs near the sea are chiefly composed of vast masses of conglomerate. In many places along the coast, beds of coral are found lying on the conglomerate rock, at a height of more than 200 feet above the sea level. There are many volcanic openings in different parts of the island. Around all of those that I have visited are found large accumulations of sulphur. This substance is met with in greatest quantity at the southern extremity of the island, in a deep and confined valley, where there are several volcanic fissures. Near most of these openings, springs of hot water issue from crevices, and in the Roseau valley they boil up in the bed of the river.

From the mountainous nature of the country, abundance of rain falls; and in the bottom of almost every valley there is a clear, running stream, fed by many tributaries.

The whole face of the island, except where cleared by cultivation, is covered with forest. In some of the valleys the forest trees attain an enormous size and height; their stately, massive trunks, rising from the ground like huge columns, excite the wonder and admiration of the beholder.

The soil differs in quality in different districts, but is everywhere fertile in the low-lying grounds, and a short way up the sides of the mountains. Still higher up, a red or yellow clay is generally found, covered by a thin stratum of vegetable mould. A substratum of clay is however very common throughout the whole island.

Of the surface of the country generally, but a small portion is in cultivation,—not more than a thirtieth part. The sugar plantations are chiefly situated in the valleys near the coast, where the soil is very productive. The mountains bordering on the sea round the whole island were at one time covered with fine plantations of coffee, which then formed the staple export of the colony. About eighteen years ago, there appeared on the trees a blight, which has completely ruined these properties,*—not much more coffee being now produced than suffices for the consumption of the inhabitants.

On the windward side of the island the trade breeze is generally regular and steady. The atmospheric current is interrupted by the high central range of mountains, and in consequence there are frequent calms on the leeward coasts, with occasional gusts of wind rushing down the ravines and valleys with much force.

Though the temperature at some seasons is high during the day, and the atmosphere close and sultry, the nights are invariably cool,—the neighbouring high mountains sending down their refreshing breezes as the sun sets.

The annexed table gives the average temperature in Roseau for each month over a period of five years. The mean annual temperature is shown by this table to be 79·40. The average maximum is 83·93, and the minimum 74·88. The mean temperature near the coast is about the same as the other islands, but the minimum range is considerably under most of them.

The subjoined table is interesting, as showing the great difference in temperature at a short distance from the coast, not more in a straight line than a mile and a half, and at a height of only 1400 feet.

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* The same fate is fast overtaking the sugar plantations, but from a very different cause. The policy pursued by the British Government to these colonies since the abolition of slavery has ruined the planters. In defiance of the express guarantee of government, the British colonist with his free labour is compelled unaided to compete with the slaveholder, while he has been deprived of every means that would have given him a chance of success;—and this is called free trade. Can there be any *free* trade when the *slave*, with the lash behind his back, is working against the free negro? Cæteris paribus, the slave will produce cheaper sugar than the free labourer, because the labour is compulsory, and will consequently be greater in amount. It is idle to assert that a free negro will do as much work as a slave. The latter, indeed, is overworked and destroyed. One result of government measures is, that slavery and the slave trade was never in so flourishing a state as at the present moment. The next results will be, the entire cessation of sugar cultivation by free labour, and that sooner than is supposed,—the loss of these splendid colonies to the British crown,—the perpetuation of slavery,—and the monopoly of the sugar market thrown into the hands of the slaveholder. The British people will then be *obliged* to buy *dear slave* sugar, while they will be consoled by the reflection of having destroyed their own colonies, and brought ruin and misery on hundreds of thousands.

	JANUARY.					FEBRUARY.					MARCH.			
	Maximum mean.	Minimum mean.	Mean temperature.	Range.		Maximum mean.	Minimum mean.	Mean temperature.	Range.		Maximum. mean.	Minimum .mean.	Mean temperature.	Rang
				from	to				from	to				from
1843.	81·45	73·	77·22	83·	70·5	81·	72·82	76·90	82·	70·5	81·66	73·	77·33	84·
1844.	81·25	72·58	76·96	82·5	76·	82·42	73·13	77·77	84·	77·	82·67	74·12	78·39	85·
1845.	81·	72·56	76·78	84·	74·5	81·	72·26	76·63	83·	76·	83·56	73·7	78·31	86·
1846.	82·2	72·16	77·9	84·	75·5	80·33	72·2	76·20	85·	74·	83·78	73·88	78·83	86·
1847.	80·	73·11	76·55	82·	75·	80·	71·35	95·77	82·	74·	81·5	72·8	76·56	83·
Mean.	81·18	72·68	77·8	83·1	74·3	80·96	72·35	76·65	83·	74·3	82·63	73·37	77·88	84·
	APRIL.					MAY.					JUNE.			
1843.	84·43	74.7	79·25	86·5	77·	86·	77·43	76·71	89·	81·	85·96	76·73	81·34	87·
1844	82·61	74·73	78·67	84·	77·	83·14	75·56	79·35	85·	77·	...	...	...	...
1845.	83·27	74·66	78·96	86·	77·	86·21	77·11	81·66	89·	80·5	86·26	77·	81·63	88·
1846.	85·	75·3	80·1	87·	78·	86 8	76·78	81·43	88·5	79·	87·2	75·56	81·29	90·
1847.	82·1	93·23	77·62	84·5	75·	85·4	76·5	80·9	87·5	80·	85·5	75·93	80·48	87·
Mean.	83·48	74·52	78·92	85·42	76·	85·51	76 67	80·01	86·82	79·5	86·23	76·30	81·18	88·
	JULY.					AUGUST.					SEPTEMBER.			
1843.	85·19	76·79	80·99	87·	79·	86·26	76·35	81·30	88·	78·	83·35	75·73	79·54	88·
1844.	...	...	.	...	...	85·67	76·87	81·27	87·	78·5	86·16	76·71	81·43	88·
1845.	86·17	76·77	81·47	88·	78·5	85·84	78·87	82·35	88·	81·	85·94	76·84	81·39	88·
1846.	87·	77·67	82·33	90·5	81·	86·7	76·7	81·7	89·	78·	85·4	76·7	80·55	87·5
1847.	83·3	76·3	79·8	89·	79·	85·	76·14	80·57	88·	79·5	84·85	76·21	80·53	86·5
Mean.	85·41	76·88	81·14	88·6	79·3	85·89	76·98	81·43	88·	78·82	85·14	74·43	80·66	87·42
	OCTOBER.					NOVEMBER.					DECEMBER.			
1843.	85·	76·2	80·6	86·5	78·	83·71	74·68	79·19	85·5	76·5	82·2	73·27	77·64	85·
1844.	86·	76·25	81·12	87·	78·	84·61	75·46	80·3	87·	78·5	83·	44·	78·	85·5
1845.	86·09	76·4	81·28	88·	78·5	83·91	75·43	79·67	86·5	77·5	81·46	73·11	77·28	85·
1846.	85·67	75·88	80·77	87·	79·	84·46	75·36	79·91	86 5	77·5	81·95	74 1	77·98	84·5
1847.	84·	75·11	79·55	85·5	77·	81·95	74·21	78·8	84·5	76·	80·	72·61	76·30	83·
Mean.	85·33	75·96	80·66	86·62	78·1	83·72	75 02	79·57	85·64	76 84	81·72	73·43	77·44	84 42

Temperuture at Gommier 1400 feet above the level of the Sea.*
Self-registering Thermometer in the shade.

1847.	Maximum Mean.	Minimum Mean.	Mean Temperature.	Range.	
				from	to
January,......	75.25	67.83	71.54	79	66
February,.....	74.89	66 35	70.62	77	62
March,.........	75.64	67.48	71.56	77	66
April,..........	76.	67.45	71 72	78	66
May,....... ...	77.83	70 58	74.20	80	68
June,..........	78.16	70.96	74.56	80	68
July,....... ...	79.29	71.54	75.41	81	69
August, ...	79.	71.18	75.09	81	70
September,...	79.90	71.50	75.70	82	69
October,.......	78.84	70.96	74.90	82	70
November,...	78.	69.83	73.91	82	66
December,....	75.48	67.48	71.48	78	62
General Mean,	77.35	69.42	73 39	79.75	66.83

It will be seen from this table that the mean temperature at 1400 feet above the sea level is lowered six degrees. Within the tropics, this difference in the range of the thermometer exerts a most material influence in point of salubrity.

The mountains of this island are the highest in the whole range of the lesser Antilles, the highest peak of Morne Diablotin reaching the height of 5314 feet. I am not aware that its summit has ever yet been scaled, though the attempt has been made. One of the highest mountains at a short distance from town, and another in the centre of the island, have been ascended.

To gain the summit of any of the higher mountains is a task by no means easily accomplished; for they rise so abruptly as only to be accessible by following the course of some steep ridge. I have twice ascended the Couliabon mountain (not far from Roseau), which is 4500 feet high. Gradually as the ascent is made, the character of the vegetation alters, and the noble forest-trees shrink into small shrubs. Still, wherever the eye rests, all is green, unless it be where dark-grey masses of rock project from the mountain sides, or a bright-red surface is left by some avalanche of earth that has been recently separated by the heavy rains, and has fallen into the ravine below. When the traveller has at length reached the highest peak, he is rewarded for the toilsome ascent by a prospect of surpassing loveliness and grandeur. The sublimity of alpine scenery is combined with the verdure and luxuriant vegetation of the tropics. On one side the spectator looks down on the country below as on a map; on the other, mountains stretch away beyond mountains, some shooting up their isolated peaks to the skies, others sloping in undulating ridges to the sea-shore. The mountain sides, brilliantly lighted up by the rays of the sun, furnish a strong contrast with the dark masses of shadow thrown on the deep ravines beyond. The snowy-looking clouds, as they float along, continually vary the light and shade; while every tint of green is beautifully blended, from the deep sombre shade of the primitive forest to the light lively hue of the cultivated cane-field. The air that is breathed is pure, and uncontaminated by the causes of disease that abound along the sea-margin, or lurk in the recesses of the ravines and valleys.

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* The residence of my friend, the Honourable Theodore Gordon, to whom I am indebted for this table, extracted from his register of the weather.

The division of the year is into the wet and dry seasons, though rain falls at all times of the year. The only difference is, that a much greater quantity falls in the rainy, or hurricane season, as it is more commonly called (beginning in the latter part of July, and ending in October), than at any other period of the year. By the register kept in the garrison Morne Bruce, it appears that, from April 1846 to April 1847, 68 inches of rain fell, and during the succeeding year 72 inches.

Vegetation is hurried on with extraordinary rapidity by the heat and light and continued supply of moisture; but decay is equally rapid. In these countries, indeed, the destructive process that is in operation everywhere, goes on with an energy and activity unknown in temperate climates. The heavy rains, followed by intense heat and high winds, act upon the cliffs, and continually detach stones and large fragments of rock. Where the roads lead under these cliffs, it is dangerous to pass during or after heavy rain. Land slips are constantly happening in all parts of the island. The mountain slopes are washed by the floods of rain in the hurricane season, and the clear sparkling streamlet becomes all at once a turbid impetuous torrent, dashing down to the bottom of the ravine to join the river below, which rolls on to the sea loaded with immense quantities of earth, vegetable and animal matter, and the trunks of trees; and sometimes large stones are carried along its bed by the force of the torrent. The ocean is tinged for miles out by the red earthy matter, and the debris is often washed up by the waves, and strewed along the coasts. Nature, indeed, in these islands, assumes her most terrible as well as most beautiful forms; for what visitations can be more appalling than the earthquake and the hurricane? The one shaking down cities in a few moments, and burying their miserable inhabitants in the ruins; the other sweeping with its destructive blast across the face of the land, and leaving only desolation and ruin behind.

The island still awaits the investigations of the geologist; and to those who take pleasure in botanical pursuits there is a rich and varied field, which has never yet been fully explored.* The woods of the country are very valuable, and of many different kinds. The wild animals and birds are few in number; but there is ample room for the researches of the entomologist, the insect tribes being very numerous.

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* I have sent several collections of dried plants to Sir William Hooker, gathered chiefly in one part of the island. Among these, many rare and some new plants have been discovered by that distinguished botanist.

The whole surface of the island being so irregular, there is comparatively very little marshy land. The only morass of any extent is near the fortress of Prince Rupert, and in consequence the district in the neighbourhood is very unhealthy.

The population, by the census taken in 1844, amounts to 22,964. The majority of the people reside on or near the sugar estates, or in detached huts and villages along the coasts; though many are located on the abandoned coffee-estates in the mountains, or on the crown lands. As may be supposed from the nature of the country, the climate varies much both in point of temperature and salubrity. One or two limited portions of the island, but chiefly around the marsh of Prince Rupert, are unhealthy, and have given the island a general character for insalubrity that it by no means deserves. Did sufficient data exist to furnish a fair statement of the vital statistics of all our West Indian colonies, I doubt not that Dominica would take a rank far above that which it now holds. It is certainly healthier than Tobago, St Lucia, and many parts of Jamaica, and equal, if not superior, to Trinidad and Demerara in this respect. The general healthiness of a country can scarcely be judged of by the prevalence of sickness in one or two limited localities. The climate of England might thus be called unhealthy, because fever abounds in the fens of Lincolnshire. The statistics of the garrison during the last ten years will, I have no doubt, show that the mortality has been comparatively small from the common endemic diseases of the island. The troops have suffered occasionally from yellow fever; but this type of fever prevails at times in Dominica in common with all the West Indian colonies. The mounting of guards, and other duties performed by the black troops, the substitution of rations of fresh meat for salt beef and pork, and the greater attention paid to the purity of the water drank by the men, have, it may be presumed, done much to diminish the mortality among the white soldiers from dysentery, which, in truth, is the most fatal disease of the country.

As in all these islands, there is a less amount of sickness in general on the windward than the leeward coasts. The mountain districts throughout the whole island are remarkable for salubrity. No other British West India colony possesses the same advantage in this respect; for an hour's ride will take the debilitated invalid from the hot, sultry atmosphere of the coast to the cool, invigorating air of the mountains. The elevation above the sea level, and the difference in temperature of six or eight degrees, gives altogether a different climate. Health returns with almost every breath that is inhaled. The change of climate and temperature is felt much more keenly than when the system is strong and vigorous; and the alteration for the better even within a short period is often very striking.

The highest position occupied by the troops in Jamaica is Maroon Town, and it appears from the army statistical report, that this post is remarkable for its healthiness. It is 2000 feet above the level of the sea; the medium annual temperature (from the statistical report) is 74½°, the maximum 80½°, the minimum 68½°. On examining the table of the range of the thermometer at Gommier, it will be seen that, at the height of 1400 feet in this island, there is a lower temperature than at 2000 in Jamaica,—the mean annual temperature at Gommier being only 73°.39. It will also be observed that the climate is more agreeable; the range at Maroon Town, from the highest to the lowest point, being 12°, while at Gommier it is only 7°.93. In this uncommonly healthy part of the country, and about the same height, is situated Morne de Moulins, formerly a military station. Now, if Maroon Town, with a higher temperature than Morne de Moulins, is beyond the reach of yellow fever, it may fairly be concluded that the latter is above the range of that destructive malady, unless the difference of a few hundred feet be of consequence, irrespective of temperature. In a former paper in this Journal, the eligibility of Morne de Moulins as a convalescent station for the troops was adverted to. The distance is not more than one mile in a straight line from the garrison at Morne Bruce, and certainly not more than a march of two hours. Were arrangements made to station the white soldiers on these heights immediately on the appearance of yellow fever in the garrison, I have very little doubt that the progress of the disease would be at once arrested. The mortality would at all events be greatly lessened, and this island would soon be considered as healthy for the troops as any of the whole range, instead of being looked upon as among the most inimical of all to the European constitution.

The main features of remittent fever in all countries where it prevails are nearly the same, and having been so well delineated by many writers, any lengthened description is unnecessary. The object of this paper is to dwell chiefly on some of the most severe and unusual forms, under which the disease presents itself in this island. It will therefore only be necessary, as a general outline, shortly to state, that after certain premonitory symptoms succeed a rigor or chills, or alternate chills and flushes of heat. Then follow general increased heat of the surface, quick pulse, restlessness, headach, flushed face, pains in the loins and lower extremities. The tongue is coated. The thirst is intense. The bowels are constipated, and the urine scanty. The hot stage, after a period of longer or shorter duration, begins to abate; a gentle moisture appears either partially or over the whole surface. The pulse moderates, and the general uneasiness and pains are to a certain extent relieved. This abatement of the febrile action will sometimes take place with a dry surface, or the perspiration may be profuse. In a few hours we have a return of all the febrile symptoms, probably much aggravated;—with delirium and other phenomena, indicating cerebral excitement. If the case terminate favourably, the paroxysms become milder and of shorter duration, until they finally disappear. If the malady run on to a fatal termination, the period of remission is scarcely observable, or the febrile action is continued. The surface is sometimes suffused with a yellowish tinge. The delirium is increased in intensity, or effusion within the encephalon is indicated by constant drowsiness passing into profound coma. The train of symptoms preceding death will depend upon the organs chiefly affected, or the extent of the disorder of the circulating fluids.

The above are the leading symptoms of common remittent fever. Its type varies with country, locality, season, epidemic, constitution, or peculiarity in the system of the individual attacked.

Though the endemic fevers of this island, when early attended to and judiciously managed, are generally amenable to treatment, and the mortality small, it should ever be borne in mind, that no case, however mild in appearance, should be considered altogether free from danger. When the patient is seemingly doing well, dangerous symptoms may suddenly set in, requiring prompt and active treatment. Lives are not unfrequently lost from the neglect of the patient or his friends at the onset. The malady may have been allowed to make such progress before medical aid is called, that probably little remains to be done.

A patient, for example, suffers from a mild attack of fever, with possibly scarcely any premonitory symptoms, or such as he has not particularly regarded. The fever leaves him, and he is so much better as to quit his bed and go out to look after his business, thinking his slight indisposition of no consequence. The fever returns, the paroxysm being somewhat more severe; still a complete remission follows, and he again leaves his bed, taking no remedies whatever for his illness. A third exacerbation sets in, with violent fever and great disturbance of the cerebral functions, or sudden and rapid sinking of the vital powers make their appearance, that soon end fatally, unless active measures are at once resorted to. This peculiarity of the sudden sinking of the vital powers, being a not unfrequent and most dangerous complication, should never be lost sight of in the treatment of our fevers. Cases presenting these alarming and dangerous symptoms may be met with at any time; but in some seasons they form the most prominent feature of the prevailing epidemic.

During the autumnal months of 1836, remittent fever prevailed very generally in the colony among all classes, the epidemic constitution being of the marked asthenic character above alluded to. The season presented nothing unusual in regard to the quantity of rain that fell and the range of the thermometer. It was observed that thunder storms were far less frequent than generally is the case in the hurricane months; indeed, it could scarcely be said that the island was visited by a thunder storm of ordinary violence during the whole season.

There was usually great prostration at the commencement of the attack, succeeded by rapid sinking of the vital powers. Severe cerebral symptoms was an invariable accompaniment of the fever. Irritability of stomach, a very common and often intractable symptom in our endemic fevers, was not of very frequent occurrence, nor difficult to subdue when present. The attack began with rigors or chills, alternated with flushes of heat, pains in the loins, great restlessness and anxiety, in general thirst. The tongue was sometimes clean at first, but soon became covered with a thick dark coating. Great functional disorder of the biliary apparatus was always noticed, as evidenced by copious discharges of morbid biliary secretions, often giving rise to severe griping pains as they passed along the intestinal canal. In most instances, remissions were observed of more or less distinctness, varying in duration from three or four hours to twelve. The details of one or two cases of the fever follow.

Visited Mrs ———, middle-aged; stout, She was taken ill with fever on the 6th September, at a healthy situation in the mountains, whither she had removed from town for change of air, in consequence of feeling rather unwell. She took a few grains of calomel, and on the following day (7th) the fever left her. On the morning of the 8th there was an accession of fever, with aggravation of all the symptoms, and an express was thereupon sent off for medical assistance. I found her in a state of great debility; pulse above 120, very weak; extremities rather cold and clammy; surface generally warm; violent headach; heat of head much increased. Little thirst; no vomiting; tongue slightly coated; moist. Bowels open; the patient complains of soreness over the abdomen, which she attributes to the ride from town. Is anxious and uneasy; says she is aware of her dangerous state.

Small doses of calomel, combined with quinine, were ordered at short intervals; nourishment, with a little wine, frequently. A blister to the nape of the neck. The feet and legs to be rubbed with a liniment of turpentine and hartshorn. When pain is felt let them be immersed in hot water. Cold affusion to the head while the feet are in the bath. Cold to the head constantly till the extreme heat is reduced.

Towards morning (9th) she rallied considerably; the pulse fell to 106, and became firmer. The head much relieved, though there was still pain. Skin warm; blister had risen well. The quinine and wine were discontinued, and calomel, combined with genuine James' powder, ordered every two hours. The bowels were, at the same time, acted on by occasional doses of sulphate and carbonate of magnesia. For the next two days there was little variation in the symptoms, with the exception of an increase of the abdominal pain, which was relieved by the application of a large blister. The coating on the tongue also became thicker and darker. The pulse varied in quickness and strength, but never sank below 100. The pain of head was at times severe, and never altogether removed. On the recurrence of the violent headach, the irritating liniment and foot-bath were resorted to, and always with good effect. Cold applications to the head were continued. Quinine, when the symptoms would permit, and calomel with James' powder, were given at intervals. The bowels were kept open by occasional purgative draughts and enemata. The alvine evacuations were dark-coloured and offensive.

On the night of the 11th, alarming symptoms of sinking made their appearance. The surface became cold; the pulse extremely weak and quick; the tongue black, but moist; the breath very fetid, with anxiety and restlessness. The calomel was discontinued, and she was ordered two grains of quinine and two grains of camphor every second hour, with nourishment and wine frequently. Turpentine liniment to be applied to the lower extremities, and blisters to the thighs.

During three or four hours she continued to sink. The surface was cold, and the pulse almost imperceptible at the wrist. The treatment was assiduously continued. Wine and brandy were administered in quantities as large as the stomach would bear.

By noon of the 12th she had rallied considerably. The skin was warmer, and the pulse more firm and slow. From the commencement of the sinking symptoms, on the night of the 11th, there was an entire cessation of the pain in head. As the pulse rose, the stimulants were gradually discontinued; the bowels were evacuated by senna draughts.

On the 13th she was much improved in every way, and from that time her recovery went on very favourably. When her strength began to return, the calomel took effect on the system.

September 9th. Called to see Fanny, a young, stout negro girl. The account given is, that she was taken ill with fever yesterday, and has continued getting worse to the present time. There is great prostration of strength; she has scarcely the power of raising herself from bed. Pulse about 120, weak and irregular; skin hot; excessive pain and heat of head. She appears rather confused, but answers questions rationally. Nervous tremors of the upper and lower extremities. Tongue has a white coating, and moist.

A large blister to the nape of the neck. Three grains of calomel were ordered to be taken every third hour till the bowels are opened, assisted by senna draughts. Cold applications to the head and cold affusion occasionally; foot-bath.

Next morning (10th) she appeared rather better. The head was somewhat relieved; the pulse more regular, and less nervous agitation. Towards evening, the violent headach returned; the pulse became so weak and quick as not to admit of being numbered; the strength greatly reduced; indeed she appeared in almost a hopeless state. Blisters were ordered to the thighs; turpentine liniment to the feet and legs, with foot-baths. Camphor and quinine every hour and a half; nourishment with wine frequently; cold to the head.

In the morning, I found that a favourable change had taken place. Although she was still very weak, the pulse was firmer and not so rapid; the head less painful, and not so much anxiety and restlessness.

For the next three or four days she remained in rather a doubtful way, a remission generally taking place in the morning, and an accession of fever at night. She was treated with large doses of quinine during the remission. When the sinking symptoms set in, camphor and quinine, sometimes combined with calomel, were given, and wine in arrow-root. The cold douche and irritating liniment were repeated till the violent head symptoms were mitigated. The paroxysms became gradually milder and less frequent, and she was soon convalescent.

The above cases will be sufficient to show the dangerous nature of the epidemic constitution of that year. Many such instances were met with, and several proved fatal. The same symptoms are, however, to be guarded against at all times; they may occur when there is no unusual epidemic influence existing, as in the following case.

August 26th, 1840. Summoned very hurriedly to visit Ledeate, sugar planter, tall, thin, middle-aged. His wife and family are standing round his bed weeping. He says he knows he is dying.

The body is covered with a cold sweat, and the extremities are very cold. The pulse is feeble and fluttering, and at times can barely be felt. Countenance pale and shrunk; voice hollow. The tongue has a thick white matting over all its surface; great thirst; bowels open; evacuations bilious; strength much reduced. The account given is, that he has had attacks of fever for the last three or four days. During the remissions, he has been able to leave his bed and walk about, and even mount his horse to visit his labourers in the field. Last night the attack was more severe than usual. His skin was burning hot; the thirst intense. He drank a large quantity of water; perspiration came on, and continued most profuse, with scarcely any abatement of the thirst. Feeling his strength failing him rapidly, and that he had, as he thought, but a short time to live, he sent an express for medical assistance. Some purgative medicine has been given. His family were requested to leave the room, and the strictest quietness enjoined. A glass of sangaree* to be given immediately. This was rejected. A little arrow-root in the meantime being prepared, was given with brandy, and retained. Camphor, quinine, and calomel, of each two grains, every third hour; arrow-root with brandy at short intervals; a little brandy and water or sangaree occasionally. The perspiration to be constantly rubbed off with warm flannels or rough towels. A large blister over the epigastrium. Not to indulge in large draughts of any kind of fluid. The thirst is still intense.

Returned in the evening, and found him somewhat improved. The pulse increased a little in strength, but still feeble and rapid. Extremities continue cold, with cold perspiration. Has vomited occasionally, but retained a good deal of the stimulus, &c.

Continue the same treatment.

27th. Considerably better; has been able to take his nourishment and stimulus well since last visit, and the medicine has been regularly given. The pulse is fuller and less frequent; perspiration not so profuse. The surface begins to recover its natural warmth. The patient is in much better spirits.

Same treatment.

Evening. Improving. Surface natural; pulse gathers strength. He now believes that he will recover. Discontinue the stimulants gradually. Nourishment in small quantities, and often. A dose of castor oil to be given in the morning.

28th. Going on well. Stimulants no longer necessary. Purgatives were administered occasionally until the tongue began to clean, and in a few days he was convalescent.

This is not an uncommon instance of the dangerous form that an attack of fever, apparently mild, may suddenly assume. The patient considered his symptoms of so trivial a nature as to refrain from sending for medical aid till well nigh too late. Life, in such cases, may hinge upon the delay of a few hours. When called under such circumstances, it is better to administer immediately whatever stimulus may be at hand, regulating the quantity by the effect produced, or the state of the stomach. If irritability of this organ exist, then the danger is greatly increased; for the patient may sink before it can be sufficiently calmed to retain the nourishment and stimulus required to rally the failing powers of life.

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* Madeira, sugar, water, and nutmeg in certain proportions.

It is not always that the result is so favourable as in the above case, as the next instance will show.

August 15*th*, 1845. Visited —— Scott, European, aged about 25, manager of C. estate; some years in the island. He has been suffering from fever since the 12th. Has not sent for medical assistance till now, four P. M. He says the fever was very hot at first, then perspiration came on. He has been perspiring since yesterday.

Clammy perspiration over the whole surface, which is cool; head painful, and hotter than other parts of the body, but moist with perspiration. Great thirst, irritable stomach, tongue coated, moist, pulse weak and quick. He is able to sit up. He has taken one dose of calomel, followed by a draught of senna and salts. A pill of calomel and opium ordered, and quinine mixture at short intervals. Nourishment frequently. A few hours after, word was sent to say that he was weaker, and very low. Stimulants, &c. were ordered at short intervals, but he continued to sink, and died the same night.

Had the patient been seen a day sooner his life might have been saved. But he was evidently deceived by the treacherous mildness of the attack.

When this sudden failing of the powers of vitality occurs, unassociated with any severe local affection, the case is much less dangerous, provided timely and active measures are adopted. If there be untractable gastric irritability, with intense thirst, the chance of recovery is much diminished; but the most dangerous complication is the presence of severe cerebral symptoms. When there is intense heat of head, delirium or coma, with cold perspirations, icy cold extremities, and faltering feeble pulse, recovery takes place but rarely. The following is a case of this character.

March 17*th*, 1835. Visited J. M'I., European, aged about 25, three years in the island, of strong constitution. Since the 13th he has had two paroxysms of fever, but in the intervals felt so well as to be able to go out of doors. He took some calomel and castor oil, also an emetic. On the night of the 16th the fever returned, with intense headach and violent throbbing over the eyes; towards morning he became delirious, with profuse cold sweats.

Present symptoms.—He is lying in a state of stupor from which he can be roused for a short time by speaking loudly to him. Answers incoherently and with difficulty. Pulse quick and feeble, extremities covered with cold clammy perspirations, heat of head increased, tongue has a yellow coating, bowels open.

Apply a blister to the nape of the neck. Four grains of calomel to be given every third hour. Cold applications to the head. Warmth to the feet. If not roused by the blister, apply another over the epigastric region. Nourishment occasionally; and if he continue to sink, give stimulants.

18th. During the night he became quite insensible, and could not be roused. The pulse at times could scarcely be felt. Both blisters were applied. The extremities were kept warm by artificial means. Involuntary discharge of urine and fæces. Very little of the medicine has been taken.

He is at present comatose. When spoken to in a loud voice, he opens his eyes, and endeavours to articulate a few words, and sinks back into a state of stupor. Pulse weak and quick, tongue foul but moist. Heat of the extremities supported by constant application of warmth.

To continue the calomel, with two minims of croton oil, till the bowels are freely acted on. Turpentine liniment and hot-bath to the feet, to be repeated every four hours. Cold to the head. Saline draughts occasionally.

19th. Sensibility restored; answers questions rationally. Pulse slower and firmer. Heat of surface natural. Tongue cleaner and moist. His friend who has been attending him says that, before using the counter-irritation to the feet and legs, he was perfectly insensible, the eyes fixed, sometimes wild and staring. When his feet began to get red, he complained of their burning him; and on putting them in hot water he became very violent. The pulse then began to rise, and was stronger. The calomel and croton oil acted on the bowels, and after each evacuation he was more sensible. The evacuations are very bilious. His mouth appears slightly affected by the calomel. Continue the calomel till the system is brought under its influence. Saline draughts occasionally. Continue the warmth to the feet, and cold applications to the head.

20th. Much improved. Salivation has taken place.

22d. Convalescent.

The counter-irritation to the lower extremities had a marked good effect in this case; but in general, with such symptoms, all remedies fail. The calomel was continued till the patient was salivated, such being the practice of the medical men of the country at the time.

November 1st, 1839. Visited —— Gibson, European, aged about 20; overseer G. estate; three years in the colony. Has had several attacks of intermittent fever. Three days ago he was seized with chilliness after a cold-bath. Since then he has had constant fever, with chills; great headach, and pains over all the body. He has vomited everything. Though feeling ill, he went to the labourers in the field yesterday and the day before.

At present there is a remission; but the symptoms denote great danger. He has perspired freely, and the extremities are cold and clammy. Pulse weak, and easily compressed; not very quick. Breathing rather hurried; great pain of head; intense thirst, but everything taken is almost immediately rejected. Pain in the region of the stomach; tongue foul, bowels not open for two days. He is very anxious.

Eight grains of calomel and half a grain of opium, in the form of pill, to be taken every fourth hour. Two hours after each pill a small dose of senna and salts to be given till the bowels are freely evacuated. A large blister over the epigastric region, warmth to the extremities, nourishment if the stomach will bear it.

2d. He vomited part of the medicine given during the night, and the nourishment. The bowels have been freely opened. Says he had a little fever in the night, but it went off with perspiration.

The symptoms are by no means improved. The extremities have the same cold clammy feel; the surface generally cold and moist; pulse weak, tremulous, and intermitting. Breathing hurried; headach without external heat; thirst intense; stomach irritable; strength evidently failing. Three grains of quinine, with half a grain of opium, to be given every two hours. Nourishment with wine every half hour. The patient still vomits, but has retained part of the food administered. Has only taken one pill from the neglect of his attendant. No amendment. Minute purplish specks, with here and there small vesicles of purulent matter, appear on the abdomen and arms.

Continue the pills, adding one grain of calomel to each. Stimulus to be frequently given.

Evening. Much worse. The medicine has not been administered, from the culpable neglect of the manager of the estate. The patient has taken some nourishment without wine, as he said he did not like it. Arrow-root in small quantities, and often. Let the pills be given as previously ordered.

3d. Retained a good deal of the arrow-root and the medicine, but is worse. He is very anxious, and asks if I think he might get up a little in the forenoon. Pulse weak, quick, and irregular; cold extremities; breathing laboured and accelerated; extreme thirst; strength giving way.

During the forenoon there was less vomiting. About two P. M. a flush of heat came over him, and immediately after he was seized with a convulsive fit. On its subsidence he was left in a comatose state. He sank rapidly, and died in the evening.

Had this poor young man applied for assistance in time, the result might have been different. When visited, the debility was so great, and the disease so far advanced, as to forbid the use of depletory measures in any form, with the exception of purgatives. The danger was not so much indicated by the mere vital depression—which might have been overcome by the exhibition of stimuli—as by the continuance of the intense thirst, irritability of stomach, and pain of head, when the more active febrile excitement had subsided. The chances of recovery were lessened by the careless and unfeeling conduct of the manager of the property.

October 18th, 1847. J. D., 21 years of age, native, stout habit of body, generally healthy, was brought up this afternoon from Prince Rupert's, where he had been residing for some time, ill with fever, which attacked him on the 14th.

The present symptoms are the following:—Weak, quick, compressible pulse. The arms from the elbows downwards cold, and covered with profuse cold perspirations. The lower extremities are cold and clammy. The general surface above the natural temperature, and dry. Face flushed. Great increase of heat about the head, with free perspiration anteriorly, requiring to be constantly wiped away; posteriorly, no perspiration. Says he has had no headach, but had pains in his limbs. Tongue moist and coated. He has vomited everything for the last two days. Great thirst. Bowels at first open, but not moved for twenty-four hours. Restless and hurried in his manner.

Twelve grains of calomel and a grain and a half of opium to be formed in three pills. One every third hour, followed by senna draught (in small quantity). To sit in hot water, in which the arms are to be immersed.

10 P. M. Two pills and the draughts have been taken and retained. Wanders at times; but when spoken to, answers sensibly. The great heat about the head continues, while the general strength is giving way. Pulse weak and quick. Partial perspiration and cold extremities continue. The perspiration almost runs from the forehead without diminishing the heat. Extremely restless.

Cupped on the nape of the neck to the extent of eight ounces of blood; blister to be afterwards applied. Cold affusion over the head. Sinapisms to be applied to the arms. Warmth to the feet. Three grains of calomel every two hours, followed by small doses of infusion of senna with sulphate of magnesia, till the bowels are acted on.

19*th*. The patient has been very restless, talking incoherently all night, though when asked a question he answers rationally. Surface generally warm and dry. The great heat about the head is unabated. Pulse and strength failing. Urinary secretion scanty. A table-spoonful of saline mixture ordered every two hours. The cold applications to the head and warmth to the extremities to be continued. If he continue to sink, add wine to the arrow-root. The purgative medicine operated freely.

Noon. The patient is still sinking. The intense heat about the head is only kept in check by the constant application of cold water. He can scarcely keep his attention fixed for a few minutes. He is extremely restless. The sinking symptoms increased, notwithstanding every means used to rouse the system and relieve the head, and he expired calmly in the evening.

In this case, as in most others of the same type, the balance of the circulation was upset, and the brain surcharged with blood. The head symptoms were rendered more formidable and obstinate in consequence of hereditary predisposition to cerebral congestion; several of the same family having died under somewhat similar circumstances.

The three last cases afford examples of the most dangerous form that the endemic fevers of the colony present. We have a concurrence of symptoms which, in regard to the indications of treatment, are exceedingly embarrassing. The great congestion, or increased action in the brain and its membranes, would require depletion for their relief. At the same time the cold extremities, feeble, sinking pulse, and general failure of nervous energy, urgently demand an opposite treatment, or the patient quickly dies. We are thus compelled to deplete with one hand and stimulate with the other; to relieve the excited or congested brain by depletion, while we support the failing powers of life by administering stimuli. Instances are however met with, where the loss of even a few ounces of blood would be hazardous. The continued application of cold and counter-irritation are then our principal remedies for the removal of the local affection. These symptoms are often induced by the patient neglecting to use the proper means at the commencement. The system is frequently loaded with disordered biliary secretions, which if not thrown off by active purgatives at the onset of the attack, appear to act as a depressing and deadly poison, affecting more especially the brain and nervous system. The probability of recovery taking place is thus greatly lessened; for in the last stage the system will not so readily support the reducing effects of active purgation, though at first such effects would rather have been beneficial than otherwise. Neither will the exhibition of stimulants, when necessary, produce the same favourable results as when preceded by purgatives.

From July 1837 to the beginning of 1838, the colony was very sickly. The epidemic constitution differed in some respects from that of 1836. The natives of the country were the chief sufferers from the prevailing fever. Although comparatively mild in character, the number of persons attacked far exceeded that of the preceding year. The fever partook more of the intermittent than bilious remittent type; but when the epidemic first appeared, there were some cases presenting the dangerous asthenic character already described. I copy from my notes of that year.

"The precursory symptoms were such as usually precede fever. Pains in the back, and sometimes over the whole body, aching in the bones, slight headach, &c. A chill or rigor of greater or less intensity was experienced, lasting from a few minutes to a quarter of an hour; but in many instances the fever commenced without any sensation of cold. In those cases there was no feeling of chilliness on the return of the paroxysm. The duration of the hot stage was very variable, remaining sometimes only for four or five hours, and at other times more than twenty-four hours. In the majority of cases the febrile excitement was relieved by profuse perspiration, which left the patient in a state of great feebleness. It was not uncommon, however, for the paroxysm to subside gradually with no perspiration whatever, or indeed without any critical discharge. Intense headach, with great external heat, were the most prominent local symptoms. The pain was often confined to one spot,—generally the forehead,—and in some instances was so severe as to induce delirium. The severe headach, and disturbance of the sensorial functions, with scarcely any exception, vanished when the paroxysm subsided or perspiration broke out. Derangement of the biliary organs was much less frequently met with than usual; nor at the commencement was there generally much disturbance of the digestive functions, the tongue being clean, or having only a slight whitish covering, the bowels regular, and comparatively little irritability of stomach being present. When the fever was neglected, the tongue became loaded, there was great thirst and aversion to food, the alvine evacuations ill-conditioned and offensive.

"The period of intermission or remission was extremely inconstant and irregular, both in regard to duration and the time at which it took place. Sometimes there was a remission of only a few hours; in other instances there was a complete intermission of twelve hours' duration,—the patient during that time feeling quite well, with the exception of being much reduced in strength. The period of invasion was, however, uncertain. The case sometimes changed into a regular tertian or quartan ague. The fever varied much in regard to the period of its continuance. If the symptoms were mild, and the necessary treatment had recourse to early, it was often subdued in a few days or a week. But if the case was severe, and remedial measures neglected, the disease fixed itself in the system, exacerbations coming on day after day for many weeks, till the patient was reduced to a state of great debility and emaciation.

"It sometimes happened that, when the fever had been absent for several weeks, and the patient had recovered health and strength, a recurrence of the attack would take place, generally with mitigated symptoms, or a change in its form, but so obstinate as to resist for months the usual treatment.

"With regard to the treatment, depletory measures to any extent could seldom be borne; nor, indeed, was the abstraction of blood often required, or followed by permanently good effects. When blood-letting was practised during the stage of excitement, the head affection was certainly relieved, but returned with equal violence when the next paroxysm of fever came on, the patient's strength being lessened by the previous depletion. The intestinal canal was cleared out by gentle purgatives. During the hot stage, saline diaphoretic and diuretic medicines were administered, and while the remission or intermission lasted, quinine was administered in quantities as large as the system would support, or the nature of the case admit. The head symptoms were combated by the constant application of cold and blisters to the nape of the neck. Great benefit was derived from the assiduous application of cold water to the head; by this means, the cerebral symptoms were kept in check, with no loss of strength to the patient,—a point of much importance, considering the general prostration that almost always accompanied the attack. The relief afforded by the cold affusion over the head was so immediate, that the patient generally requested the jug of water to be brought when the pain returned.

"The sulphate of quinine was given in doses of from two to five grains every second or third hour, when the febrile excitement had so far subsided as to allow of its exhibition. If the case was treated early, and the quinine given in sufficiently large doses, it acted as a specific, the fever being either at once arrested in its course, or each succeeding paroxysm rendered milder. It was never considered safe to discontinue the quinine till the patient had been convalescent for several days; it was then left off gradually by diminishing the doses daily. If, from any cause, the quinine was administered in small quantities, it appeared to make very little impression upon the disease."

One or two cases are subjoined.

September 25th. Visited G. H., aged 12. Health usually delicate; has had fever for two or three days. She is at present delirious; heat of head greatly increased; skin hot and dry; countenance flushed; pulse 140; thirst.

Cold affusion to the head after removing the hair; cold applications constantly; foot-bath. Two grains of calomel and three grains of genuine James' powder were ordered to be given every second hour, with a table-spoonful of saline mixture till the bowels are acted on and perspiration appear.

Evening. Has perspired freely; delirium gone; has no recollection of what happened during the day; skin cool and moist; pulse moderated; very little headach; bowels open. To commence with quinine in an hour or two.

26th. Has taken several doses of quinine. No fever. Continue quinine.

Evening. Had a little fever during the day, but with no disturbance of the sensorial functions. Give the quinine as before.

28th. Had no return of fever. Convalescent. Continue the quinine for several days.

September 27th. Visited Mrs P., elderly widow lady, who had seldom been sick, but who was attacked with fever five days ago, and has had a daily paroxysm since. The exacerbation comes on in the morning with chilliness, which remains about half an hour, when the hot stage commences with severe headach; the fever leaves her at night, but without perspiration.

Present symptoms. Excruciating headach, confined principally to the forehead, with darting pains now and then. Heat of head not much increased. Intolerance of sound; light not disagreeable; pulse 112, weak; extremities cool; much thirst; tongue slightly coated; bowels open, having taken several senna draughts.

Hot foot-bath; cold affusion to the head; blister to the nape of the neck. A table-spoonful of saline draught every two hours.

Evening. Pain of head gone. The blister was not applied, as she felt so much better. Pulse 90. Perspired freely, which she has not done since the commencement of her illness. Quinine ordered every third hour.

28th. No return of fever. Continue quinine; senna draught.

Evening. The fever returned, and the headach was so severe that the blister was applied, which now begins to give pain. Headach at present slight; nearly free from fever. Give quinine during the night.

29th. Has been suffering during the night from severe spasmodic pain of the stomach, to which she is at times subject. No fever. One ounce of castor oil with thirty minims of laudanum to be taken immediately. Hot fomentations over the epigastric region, and foot-bath.

Evening. Is now free from pain, but a good deal exhausted. A little wine may be given in arrow-root.

There was no return of fever, and the case did well under the common treatment.

It is unnecessary to continue the relation of cases. The peculiarities of the fever were, its being confined chiefly to the native population of all colours; its very irregular character; being sometimes remittent, at other times some form of intermittent, or changing from one to the other, while severe head symptoms, lasting only during the hot stage, were invariably present. The great increase in the temperature of the head and violence of the pain, in many cases bearing no proportion to the slight febrile excitement, were such as might have led to the supposition that some serious cerebral affection existed, but for the amelioration or entire cessation of those symptoms on the subsidence of the paroxysm. It was oftentimes very remarkable to visit a patient labouring under hot fever, intense headach or delirium, intolerance of light and sound, and, on returning in a few hours, to find every bad symptom gone, the patient suffering only from great prostration of strength. I was not aware of any case of this type of fever ending fatally; it could always be mastered by the early and liberal use of quinine. Six or eight grains between the paroxysms were sometimes sufficient to affect the system, while in other instances the point of saturation was not attained until probably more than thirty grains had been administered. This most valuable medicine utterly failed in its curative effects, when the yellow fever broke out among the European inhabitants, and committed such havoc a few months subsequent to the disappearance of the fever above described.*

During the hurricane months of 1845, remittent fever, accompanied by inflammatory irritation of the respiratory passages, prevailed to a considerable extent in the colony. The symptoms were those of mild remittent fever, complicated with influenza, or of influenza presenting symptoms of a remittent character.

There were seldom any premonitory symptoms, the patient being generally in good health before the attack, which never came on with distinct rigors, and only sometimes with a slight chill. General febrile heat was experienced, with severe pain in the upper and lower extremities. The whole surface was often sore and painful to the touch. In many cases, the mucous membrane of the nostrils, frontal sinuses, and air passages generally was affected as in common influenza. There was usually much depression, and the patient was left in a very weak state for several days after the cessation of the febrile symptoms. While the remissions lasted, the patient was, in a great measure, free from pain, which returned with the exacerbation. The treatment consisted in the administration of gentle purgatives, sudorifics, the warm-bath, and quinine. When the latter was given in sufficient quantity during the remission, the febrile paroxysms were arrested. No fatal case occurred with the above symptoms.

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* See No. 142, Vol. liii. p. 78, Edin. 1840, of this Journal, where an account of the epidemic yellow fever is given.

The summer months of the succeeding year (1846) were marked by a higher range of the thermometer than usual, and, in consequence of the great heat, much sickness was anticipated when the heavy rains of the autumnal season set in. The hurricane months, notwithstanding, passed over with even less sickness than common. The whole year, indeed, was remarkably healthy.

In the autumn season of 1847, remittent influenza again prevailed widely without any apparent cause. The type was precisely the same as that of 1845. Though the symptoms were very troublesome, and much debility followed the attack, it was not of a dangerous nature.

It may be worthy of notice, that when the remittent catarrhal fever of 1845 began to subside, an epidemic broke out among the horses throughout the whole island. The nostrils discharged a thin clear fluid, which afterwards became opaque. There was slight cough, accompanied by fever. The disease continued from a few days to two or three weeks, but was not fatal in its consequences. It appeared evidently to be of the character of influenza. If such were its nature, it shows that the lower animals are sometimes subject to the same epidemic influences as man.

In making a few general observations on the treatment of remittent fever, it may be premised, that the curative means on which we place the chief reliance, are the judicious use of the lancet, quinine, and calomel.

Within the last quarter of a century, considerable changes and modifications have taken place in the mode of treating West India fevers. The lancet is, I believe, used with a much more sparing hand; neither is it considered absolutely necessary to exhibit calomel in order to produce salivation; while quinine is given in much larger quantities, and with the view of saturating the system.

With natives of the country, or those who have been long resident, the necessity of general blood-letting may be considered as rather the exception than the rule. It is in the treatment of the fevers of Europeans newly arrived that blood-letting is of the greatest service. When there is a full bounding pulse, dry burning skin, intense headach, or other severe local symptoms, sanguineous depletion is clearly indicated. But even here let not the young practitioner for a moment imagine that the attack is to be cut short by the active use of the lancet. We shall suppose, in a case of this nature, that the arm is bound up,—a vein is opened,—the blood gushes forth freely. The headach now subsides; the deep flush on the countenance disappears. The dry burning heat gives place to a gentle moisture over the surface;—drops of perspiration roll from the forehead. The patient feels faint and lies down, expressing himself greatly relieved. The medical attendant retires, and on returning in an hour or two he finds all the favourable symptoms vanished. Again the patient is tossing about with dry hot skin, bounding pulse, and racking headach. These symptoms may be moderated in violence, or they may be as intense as at first. The vein may be opened a second time, and the like pleasing but fleeting results follow. Meanwhile, with the loss of the vital fluid, the patient loses that strength which is to carry him through the attack, while the regular course of the fever is not to be shortened by the blood which has been taken away, unless, indeed, it be by inducing complete prostration. It will, however, sometimes be observed, that phlebotomy accelerates the critical discharge from the skin, and the remission takes place; but this will generally happen when the paroxysm has lasted for several hours, and would probably have subsided in the natural course.

It is not always that we meet with these high febrile symptoms in the fevers of newly-arrived Europeans. The type that prevails at the time may give a different character to the attack. There may be a weak rapid pulse from the onset, with great prostration, contraindicating depletion.

The effect of paludal poison, or whatever the nature of the morbid agency producing periodic fevers may be, on the animal economy, is of a depressing nature. It is true that the action of the heart and circulating system may be much increased, but this is conjoined with great loss of nervous power. Though high febrile action must often be controlled by depletion, and inflammatory action repressed, should it be lighted up in the course of fever, this depressing influence of the fever poison should never be lost sight of, and lowering measures be carried no further than really required. This remark is made as applying more particularly to the fevers of this island; for in other countries, depletion may be much more necessary, and less likely to be followed by the extreme prostration so often occurring as a consequence in this colony.

The chief objects, then, we have in view, in taking blood from the system, are,—to lower high febrile action, not to cut short the attack, inasmuch as the lancet cannot reach the cause of the febrile commotion,—and to relieve congestion, or, it may be, inflammatory action in one or more organs. When there is much local action, topical depletion will often produce the desired relief without the debilitating effects of general blood-letting. These local affections can scarcely be dealt with as common attacks of inflammation, for they are a consequence or part of the fever; and fever, in truth, is not a local but a general disease. The blood is affected; the whole system is disordered.

In determining on the propriety of blood-letting, we must always keep in view peculiarities in the constitution of the individual, the stage of the fever, and the habits of the patient; for if he has been intemperate, the lancet ought almost to be proscribed, rapid and fatal sinking of the vital powers being sometimes the immediate result of loss of blood.

In the sulphate of quinine we happily possess an agent that may generally be considered as an antidote to the poison that generates periodic fevers. Its power in putting a stop to the paroxysms of remittent as well as intermittent fever, is very great. Its action will depend much upon the mode in which it is administered, as well as upon the period of the disease at which it is commenced. It may be laid down as a principle, that quantity is not so much to be looked to as the effect produced. Six grains may exert the same salutary influence in one person as sixty with another. To destroy the febrile poison, and produce its specific effects, it is necessary that the medicine be exhibited up to the point of tolerance in the system, which is indicated by phenomena that are familiar to tropical practitioners. A sense of fulness about the head is experienced, with a rushing noise as of water falling; there is ringing in the ears and deafness; sometimes nervous agitation or a feeling of slight intoxication. One or more of these symptoms are felt by the patient according to the quantity of the medicine administered. The above fact, as to the necessity of exhibiting this valuable febrifuge up to the point of saturation, is of great importance, and has, I believe, been well known to most West India medical men for several years past.

It appears to be almost a necessary condition that the quinine be given till it produce some of the symptoms already noticed, to enable it to contend with and master the febrile poison; short of this, it is much less efficacious, if not indeed powerless.

It is sometimes curious to observe the struggle that apparently takes place between the two antagonistic powers. When quinine has been given during the remission in the necessary quantity, at the time the access is expected, the patient may be seized with an indescribable feeling of restlessness, unaccompanied by actual pain or febrile heat; he tosses about in bed, but can scarcely say what is the matter. In a little time this feeling goes off, and the patient is again well, or there may be a mild paroxysm of fever. The full action of quinine is not always a positive preservative from a return of the fever; it may and does very often recur, though usually in a much milder degree. Patients will sometimes remark, in rather a disappointed tone, "I have got the fever again, though the quinine is ringing in my ears."

The manner in which I have been in the habit of administering quinine, is carefully to watch the slightest appearance of a remission in the symptoms. If the headach and pains in the back and lower extremities subside; if the surface, previously dry, becomes moist; if the patient was delirious and has become sensible; from two to five grains are then administered every two or three hours; but if the case is urgent, every hour or half hour, until its usual effects on the brain and nervous system are perceived. The form of administering the medicine will depend upon circumstances. It appears, however, to be taken more rapidly into the system when given in solution with sulphuric acid; and I have sometimes thought that a less quantity was required when given in this manner. But the stomach will often reject the acid solution, and it is sometimes disagreeable to the patient. The addition of sulphate of magnesia to this solution, when it is necessary to act on the bowels, will frequently be advantageous; or if judged advisable to give calomel during the remission, both medicines may be very well combined. As soon as the patient complains of deafness, noise in the ears, &c., the medicine is discontinued for the time. The quantity that produces this effect will be found to vary much in different individuals, though from fifteen to twenty-five grains is the most usual quantity.

It is not sufficient that the system be only once brought under the full influence of the quinine, and the medicine be afterwards discontinued. To insure the patient's safety, its action must be kept up for several days, though probably not to the same extent as when first administered. It is also prudent to continue the medicine in smaller doses for some length of time after the patient is quite recovered. It is difficult to prevail upon some persons to follow out this treatment, even when the object is fully explained to them; the consequence is oftentimes a return of fever when least expected.

The practice of administering quinine in large doses, as fifteen or twenty grains at once, has lately been strongly advocated as necessary to the final and efficient treatment of endemic fever; but if the same salutary effects can be produced by giving it in divided doses at short intervals, would not the permanent deafness and other rather serious accidents that are caused by excessive doses be avoided? I have met with very many instances where patients could not take beyond eight or ten grains without suffering seriously. In the case of an intimate friend, a single grain produces extreme excitement of the brain and nerves. In only one instance in my own practice have I met with rather serious effects from an over-dose of quinine. Miss T——, aged 20, of nervous temperament, in delicate health, subject to an asthmatic affection, was attacked with mild remittent fever, severe fits of coughing occurring during the paroxysms, but leaving her with the fever. She was ordered quinine in small doses at first to ascertain its effects on the system. She took 2½ grains during one remission; when the fever abated it was again resumed in grain-and-a-half doses every two hours. After the second dose, her sister observed that she was drowsy, but gave the same quantity a third time. The effect of this was to throw her into a complete state of coma. On visiting, I found her lying in a perfectly senseless state, with such symptoms indeed as caused considerable uneasiness both to myself and her friends. The usual means were had recourse to for the purpose of rousing her, but six or eight hours elapsed before sensibility began to return. Had fifteen or twenty grains been given in this case at one dose, what would have been the consequence?

If it be an acknowledged principle that quinine exerts its salutary properties in the cure of fever as soon as it affects the nervous centres, it may be asked if the presence of a greater quantity in the system than can effect this end is necessary or desirable? Is it not more likely to be injurious when given in excess? If mercury is exhibited in any disease with the view of bringing the system mildly under its influence, will not the result be as favourable as if violent salivation had taken place. Did the same dose of quinine always produce like effects, the matter would be much simplified; but finding, as we do, such diversity among different individuals in this respect, it does appear to me that giving the medicine in divided doses is the safer plan, allowing a very short interval between each, when the case is urgent.

Quinine is sometimes exhibited in large doses at the onset of fever during the hot stage; but I am not aware that a sufficient number of facts exist to show that this mode of administering the medicine has any advantages over the usual practice of introducing it into the system as soon as there is the slightest appearance of the period of remission. Before admitting the superiority of this method of exhibiting quinine, it must be tried in different countries over a series of years, in severe and dangerous as well as mild epidemics. If it can then be shown that the mortality has been lessened by this practice, it should be universally adopted. I cannot avoid thinking that, in fevers where there is high febrile action, or where the system is loaded with disordered biliary secretions, it might be preferable first to lower the febrile excitement and act upon the morbid secretions, for then it may be presumed the quinine will be more likely to exert its antifebrifuge properties. In cases of paludal fevers, where at the commencement there are no very dangerous symptoms, or evidence of any organ being seriously involved, quinine may no doubt be given with perfect safety, and it may be advantageous. But, on the other hand, when the attack begins, as not unfrequently happens, with violent head symptoms, or there is great pain and tenderness over the region of the liver, would it be equally prudent at once to pour quinine into the system in large doses without previously endeavouring in some measure to remedy the local mischief that is going on? What is the effect of quinine given in this manner? Does it shorten the paroxysm? or does it simply remain in the system, and come into operation on the occurrence of the remission? If it can be shown that the former is the case,—that, on the ingestion of large doses of quinine, the paroxysm is shortened or at once arrested,—it is clearly the preferable mode of administering the medicine. If the latter, the advantages are not so evident, for it is taken into the circulation so rapidly from the stomach, that its curative effects may be brought to bear as readily the one way as the other. The question, however, is not one merely of opinion; it can only be decided by careful and impartial observation.

The great value of calomel as a therapeutic agent in the treatment of tropical fevers is generally admitted, though the manner of administering it has undergone considerable modifications, and the same results are not expected from it as formerly. Mercury is by no means so generally looked upon now as a specific for fever, and, in consequence, calomel is seldom given in the immense doses that used to be common in former times. This is, unquestionably, a very great improvement. The object being to salivate as rapidly as possible, calomel was poured into the system in large and frequently-repeated doses until ptyalism was produced. The patient had thus to endure the suffering of a severe salivation, the debilitating effects of which, with the exhaustion arising from the fever, greatly protracted the period of recovery. By exhibiting calomel in this manner, its action was but little under control, and patients were often salivated when the attack of fever was mild, and there was no necessity for so severe a measure.

Very frequently in proportion to the severity of the attack will be the difficulty of bringing the system under the specific influence of mercury. It is true that, if the patient is once fairly salivated, he may generally be considered safe; but then, he would in all probability have recovered without the salivation. In some states of the system, it is almost if not altogether impossible to effect ptyalism, though at other times the same individual may be easily enough affected.

It is of the greatest consequence to act promptly and energetically on the intestinal canal in the treatment of remittent fever; morbid secretions are thereby carried out of the system; the liver and other abdominal organs are relieved; the intensity of the head symptoms is reduced; the remission is more likely to be distinct, and the sulphate of quinine to act with greater power. When there is much gastric irritability, this object cannot always be effected so quickly as would be desirable. At the commencement a full dose of calomel is generally indicated—from five to ten grains; for no other purgative will be followed by equally beneficial effects. The calomel may either be given alone or combined, according to the exigencies of the case. Gastric irritability is a symptom so common and unmanageable in the bilious fevers of this island, that it is often a matter of extreme difficulty to succeed in getting purgative medicine to remain on the stomach, particularly if given in a bulky form. In such cases, it is necessary to allay the irritability of stomach by administering opiates previous to or in combination with purgatives. This is usually best effected by opium and calomel in the form of pill. When the stomach is quieted, calomel may then be given alone, or combined with other purgatives, in doses of two or three grains at intervals, with intermediate purgative draughts, till free alvine discharges follow. The gastric irritability is kept in control by stimulating embrocations, sinapisms, or blisters over the epigastric region. The draughts are given in quantities not larger than a claret-glassful at a time; for while this tendency to vomiting continues, a large draught of any fluid whatever will almost instantly be rejected, while smaller doses given at intervals will be retained, and act with equal efficacy.

When the bowels have been freely acted on, and the symptoms are ameliorated, the calomel is discontinued, at least for a time. The action of the medicine on the system is also carefully watched. If the patient complain of soreness or stiffness about the throat, —if the slightest swelling or soreness of the gums appear—any taint in the breath, or the least symptom is manifested of its specific operation, the exhibition of the calomel is immediately suspended, for its action will still proceed to a certain extent. Severe salivation can thus be generally avoided, and any benefit that may arise from the specific action of mercury is obtained without much inconvenience to the patient. When calomel has been given in large and frequently-repeated doses, it is impossible to tell how far its effects will go; and if a grain or two be taken after the slightest appearances of its specific operation have shown themselves, severe and protracted salivation may be the result.

It may be observed, that when certain symptoms are present, and calomel has been given in considerable quantity, it may lie dormant for a time, and afterwards act with an energy by no means to be wished for. In the low sinking stages of fever, it will be found almost impossible to bring the system under its specific action, even if desired; it is therefore better to suspend its administration. Should the medicine be given during this period of depression, when the pulse recovers strength, the surface its natural warmth, and the nervous energies are restored, the patient may be suddenly and violently salivated. Nay, when the calomel has been discontinued for some days, salivation may still take place on recovery from this state of collapse, as may be seen in some of the cases related.

As there are few instances of remittent fever in which the biliary organs are not more or less implicated, it will be found that calomel, from its action on the liver, is by far the best purgative that can be employed. It is of great value when the tongue is loaded with a yellowish or dark-coloured coating, the stomach irritable, with great thirst, and tenderness over the epigastric or right hypochondriac regions; the skin being of a lurid or yellowish tinge, the heart and circulating system acting feebly, the urine scanty and tingeing the linen yellow, the strength much reduced,—such symptoms indeed as denote great contamination of the circulating fluids. In these cases there is no other medicine that will act so quickly and efficaciously in removing diseased biliary matter, and rectifying the disordered state of the secretions and excretions. Depressing treatment in any other form but that of purging will in general be injudicious.

The effects resulting from the operation of calomel will often be the reverse of debilitating. As its purgative action goes on,—as the morbid secretions are carried out of the system, it appears as if a load that had been pressing on the springs of life were removed; for the heart and blood-vessels will act with greater freedom; the skin perform its functions more readily; the mind, if previously disturbed, will become clearer, and far from prostration ensuing, strength returns.

These beneficial effects are not however to be expected when the treatment has been commenced at a late period in the disease.

The powerful action of calomel on the liver and biliary secretions may sometimes be observed when it is given subsequently to the exhibition of other purgatives; the latter may have only produced watery evacuations, while a full dose of calomel will be followed by the copious discharge of diseased biliary matter. The medicine given in powder will sometimes be retained when everything else is rejected.

When there is great irritability of stomach, and the bowels are at the same time constipated, the addition of one or two drops of croton oil to a pill of calomel and opium will be found extremely useful. The croton oil can be so readily administered, and its action is so powerful and rapid on the intestinal canal, that, in certain cases, we can scarcely substitute any other purgative that will act with equal certainty and benefit: when, for instance, the gastric irritation is extreme, the cerebral symptoms alarming, and the intestinal canal is at the same time torpid. The stomach may have rejected every kind of medicine, or part may have been retained but has failed to act. If the object in such cases be to operate freely and quickly on the primæ viæ, croton oil is invaluable from its certain and energetic action. Calomel alone is not sufficiently powerful.

Castor oil is very commonly used in this country, and is an excellent purgative in fever, if the stomach will retain it, which is not often the case if the symptoms are severe.

Emetics under any circumstances whatever should be ordered with great caution. I have several times had occasion to witness very dangerous consequences from their use,—such as rapid loss of vital power, requiring the exhibition of strong stimuli,—or, what is more frequent, gastric irritation that no means afterwards will allay.

It need scarcely be remarked, that saline diaphoretics and diuretics form excellent adjuvants in the treatment. Cold sponging will sometimes afford much relief when the surface is dry and hot. Local action requires to be carefully watched, for mischief will oftentimes go on very insidiously. The brain is very frequently affected, and after death will sometimes be found greatly congested or inflamed; or there is serous effusion in the ventricles, at the base of the brain, or between the membranes. Dissection will sometimes reveal inflammation or disorganization of the liver or the lungs, most frequently the former. The stomach will sometimes be inflamed and abraded, while the symptoms during life have scarcely been such as to indicate lesions of so serious a nature. The fever poison may destroy life without causing much or any structural alteration, or at least such as are discoverable by our present modes of investigation. The circulating fluids in such cases are evidently so contaminated or disorganized, that the functions of life cannot be carried on.

The low, asthenic form of fever demands the liberal use of stimuli, but only while the sinking symptoms remain. To lay down any one plan of treatment, as applicable in every particular to the endemic fevers of these islands generally, would be as unphilosophical as practically inefficient; for not only do the fevers of the torrid zone differ from those of temperate climates, but even within the tropics difference in locality, or in the physical aspect of a country, will cause the symptoms of the same type of fever to vary much. The remittent fevers of Antigua and St Christopher's may differ in character from the same disease in

Dominica and St Lucia. In the same island the epidemic constitution will often stamp a peculiarity on the endemic fevers, requiring the treatment to be modified accordingly. The fevers of one year, for example, may present such symptoms as indicate the necessity of depletion; at another time the type may be asthenic, and an opposite course is required. The local symptoms may also vary; sometimes the brain and nervous system are chiefly implicated. Again, the biliary apparatus is most prominently affected, or the respiratory organs may be attacked.

The causes of our endemic fevers reside permanently in some localities; but in certain seasons remittent and intermittent fevers become prevalent throughout the island. The influence of locality may nevertheless be still observed, for the more elevated the position, the number attacked will be smaller, and the cases milder and more amenable to treatment. The Prince Rupert's district is justly considered the most unhealthy part of the island; and the cause is evident in the extensive morass and low-lying swampy land in the neighbourhood, from which are eliminated the noxious exhalations that generate fever. In other parts of the island considered unhealthy, we have the same conditions, but in a less degree.

Though the causes from which periodic fevers originate are permanent in the country, yet do they not always operate with the same energy. Sometimes these morbific agencies remain in almost a quiescent state, and fevers occur comparatively rarely. At other times they manifest unusual activity, and then we have remittent and intermittent fevers in abundance. That season has a powerful influence in giving activity to these morbid poisons, or in predisposing the economy for their operation, is clear; for as the autumnal months come round, so also do our fevers assume a more severe character, and occur more frequently.

The fact is well ascertained, that fevers prevail with greater frequency from July to October than at other seasons; yet it is difficult to say why this should be. It cannot be heat alone; for there may be as high a temperature at other times, or the season may be unusually hot, and yet no sickness prevail. It is not moisture alone; for we may have heavy rains, and yet the country remain healthy. Nor does it always arise from heat and moisture combined; for we have often hot rainy seasons, with very little sickness. Some hidden element must therefore enter into the chain of causation of which we are in no ways cognisant, but which, in certain situations, and at certain seasons of the year, is more active than at others, though not uniformly so.

Throughout the West Indies generally, wherever we have morasses, or low-lying swampy land, there periodic fevers are met with in greatest frequency and severity. It seems, therefore, a fair conclusion to come to, that where there is a morass with a certain degree of temperature, the inhabitants in its neighbourhood are, as a necessary consequence, subject to attacks of paludal fevers; and the fact invariably holds good, so far as this part of the world is concerned. But if we take a wider range of observation, we find that we are again at fault. The army statistical report states that the island of Mauritius, in the Eastern hemisphere, resembles Jamaica in its physical characters. The temperature is the same; it lies nearly in the same latitude, but to the south of the line; morasses and marshy land occur as frequently in the one as the other. And yet periodic fevers are rare in the Mauritius, and the mortality small from this cause; while in Jamaica the reverse is the case, remittent fever being a common and fatal disease. Here we have the same apparent conditions, stagnant water, with decaying animal and vegetable matter at a certain temperature and elevation, not, however, followed by the same effects on the human organization. It is thus evident that swamps may exist within the tropics without the presence of what has been considered their invariable product, malaria, or it is eliminated in a very trifling degree. We must therefore infer that some other element which eludes our observation is necessary for the generation of periodic fever, or to give a morbid activity to the exhalations that arise from morasses. The term malaria does often appear to be applied in a somewhat indefinite manner as a cause of fever. That swamps within the tropics and elsewhere, under certain unknown states, give forth emanations that act as a deadly poison on the animal economy, is a fact but too well established; and this poison is called malaria. An epidemic fever makes its appearance where there are no swamps, where the country may even be dry and rocky; still the cause is malaria. On ship-board a dangerous febrile epidemic breaks out; again the cause is malaria. What then is the nature of this subtile agency, that is generated under conditions so diverse, in circumstances so various? What is there to prove that the dry rock has given forth precisely the same cause of disease as the deadly swamp? Is not this rather an assumption than a fact already established? Is not the word malaria often used to conceal our ignorance rather than to throw light on this obscure subject? It would surely be more philosophical at once to acknowledge ignorance, than to assume causes without sufficient proof; for by assuming more than facts will authorize, we obstruct the path of inquiry, instead of leaving it open to others who may be more successful in finding the right direction to the truth. Hasty generalization,—taking for granted what still remains to be proved,—can only serve to retard the onward march of medical science. When causes have once been assigned for the generation of disease, it is much more easy to adopt those opinions, than to strike out into the path of independent inquiry. It is much more difficult, if an epidemic break out, to admit ignorance of its cause, than to assert boldly, that it has its origin in the neighbouring pond, or arises from the wet weather, or the dry weather, or the blowy weather, as the case may be. At the same time, every circumstance connected or associated with the outbreak of epidemics, or the general prevalence of fever in particular localities, cannot be too closely or minutely observed; nor can too much caution be exercised in drawing conclusions therefrom.

We might enter into speculations on the probable causes of fever; on the changes that may take place in the elements that surround us, injuriously affecting the human frame, or of chemical alterations in our own organization predisposing to disease; of different kinds of poison floating in the atmosphere and giving origin to diseases of diverse types, or modifying their more abiding causes; of the very probable influence of that powerful and all-pervading agent, electricity. Such speculations can however be of but little service. Truth can only be arrived at by labouring in the legitimate path of observation and experiment; the result of which, in connection with the general progress of science, will doubtless ultimately remove much of the darkness that hangs over that difficult, yet most important question,—the origin of fever.

JOHN IMRAY, M. D., &c.

Since writing the above paper, I have read with much interest a review in this journal of Dr Stevens's work on the blood, &c.* The treatment proposed by Dr Stevens for yellow fever demands the serious attention of the profession in this part of the world. In the epidemic yellow fever of this island, in 1838, the saline treatment was tried by the medical officers in the garrison as well as the civil practitioners, but it was not followed by the favourable results expected. This may possibly have arisen from the salts not being properly combined. It certainly behoves every West India practitioner to give a fair trial to this treatment, exactly in the manner proposed by Dr Stevens, especially as the ordinary modes of treating yellow fever are so unsuccessful. If malignant yellow fever can thus be so disarmed of its deadly virulence that 49 out of 50 cases will always recover, then has Dr Stevens conferred on the West Indies and other tropical countries a boon of inestimable value, and earned for himself a name that will be associated with that of Jenner and other benefactors of the human race. Be this as it may, to Dr Stevens is unquestionably due the whole merit of first calling the attention of the profession to the diseased state of the blood in the fevers of these countries; and his views with regard to the disordered state of the circulating fluids have been borne out by the observations of others.

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* Edinburgh Medical and Surgical Journal, Vol. lxviii., p. 418. Edin., 1847.

The opinions held by Dr Stevens of the origin and contagious nature of yellow fever, do not appear to be so easily maintained. The mass of evidence is entirely on the other side. At all events, I believe these opinions will be supported by a very small minority of West India medical men.

ART. II.—*Remarks on Deodorization, Disinfection, and on Sir William Burnett's Disinfecting Fluid, the Solution of the Chloride of Zinc.* By THOMAS STRATTON, M. D., Surgeon, Royal Navy, Particular Service.

HAVING, during the last nine months, since August 1847, made extensive use, in various emigrant fever hospitals and elsewhere, of Sir William Burnett's disinfecting fluid, the solution of the chloride of zinc, I beg to offer a few remarks on some of its effects and uses. I shall consider, *first*, its antiseptic; *secondly*, its deodorizing; and, *thirdly*, its disinfecting properties.

I. As an antiseptic, it is exceedingly useful for preserving dead bodies for the purpose of dissection. The strength is, one part of the fluid to forty parts of water; with this, the arteries are injected previously to using the common paint injection; afterwards, while the dissection proceeds, the parts may be occasionally sponged with the diluted fluid; or the body or part may be immersed in it for a short time every four or five days. Some other antiseptic agents have the effect of blunting the dissecting-knives, which is not the case with this fluid. Other solutions are apt, when the parts become dry, to leave gritty particles; but the chloride of zinc is so deliquescent that this cannot happen with it. For preserving anatomical preparations, the diluted fluid may be used instead of spirits of wine. Besides preventing farther decomposition, the fluid destroys any disagreeable odour from decomposition that has already commenced. It is unnecessary to enlarge on the beneficial consequences of using this fluid in dissecting rooms, where students, breathing the contaminated air for several hours a day, have their digestion impaired, their general health injured, and are thus made more than others liable to suffer from exposure to infectious diseases. A great obstacle to making *post mortem* examinations in private houses is the disagreeable odour attendant thereon, and which is only questionably remedied by the odour from chloride of lime; but, as the Burnett fluid is odourless, it is consequently superior to this last, and also it perfectly overcomes the cadaveric odour. When one has made an autopsy, generally some odour is attaching to his hands for several hours; but by dipping them for a minute or two in the diluted fluid, this odour disappears. In Montreal, the Burnett fluid has been successfully used for anatomical purposes by Dr G. Campbell, Dr Arnold, Jun., Dr Long, Dr Wright, Dr Baker, and others, and has come up to the recommendations* given of it by Professor Sharpey, Mr Partridge, Mr Pettigrew, and Mr Bowman of London, and Sir James Murray of Dublin, and others concerned in the teaching of anatomy. In Quebec, the fluid was used while managing autopsies by Dr Racey, and I showed to various medical men there the difference between a portion of a subject treated with the fluid, and another portion left untouched.

II.—*Of the Deodorizing Properties of the Burnett Fluid.*

1. With regard to its action on feculent odours, we may observe that fæces contain, 1. ammonia; 2. sulphuretted hydrogen; 3. decomposing animal matter; 4. occasionally fresh animal matter, as in some diseases where there is a motion soon after taking food. When the fluid is added to the above matter, the chloride of zinc acts on the fresh animal matter, prevents decomposition, and the consequent evolution of offensive odour; also on the decomposing animal matter, preventing further decomposition; part of the chloride of zinc gives its chlorine, and the sulphuretted hydrogen gives its hydrogen to the ammonia to form odourless muriate of ammonia,—the sulphur combining with the zinc to form sulphuret of zinc. As the ammonia is the vehicle of the feculent odour, feculent matter ceases to emit any effluvium as soon as the ammonia becomes muriate of ammonia.

2. *Action of the Burnett Fluid on urinous odours.*—Among the ingredients of the urine are, 1. ammonia; 2. decomposing animal matter (mucus); 3. occasionally phosphuretted hydrogen; 4. water. The fluid instantly and permanently removes the odour of fetid urine, by causing the formation of muriate of ammonia and phosphuret of zinc; while part of the chloride of zinc, or oxide of zinc, acts on the decomposing animal matter.

3. *Action of the Burnett Fluid on the odour of bilge-water.*—The odour of bilge-water arises from sulphuretted hydrogen; and this gas is produced in consequence of the wood being decomposed and resolving itself into carbon, hydrogen, and oxygen, and these acting on the sulphates of lime and magnesia in sea-water, there are formed sulphuretted hydrogen, and also carbonate of lime and of magnesia. I found that when the Burnett fluid is added to very offensive bilge-water, the odour immediately disappears; sulphuret of zinc and muriatic acid are formed. Any remaining fluid that has no sulphuret of zinc to act on, acts in a preservative manner on the wood of the ship, and contributes to prevent any further production of sulphuretted hydrogen.

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* In Reports on the Solution of Chloride of Zinc (Sir W. Burnett's Disinfecting Fluid). Printed for Her Majesty's Stationary Office, London, 1847.

4. The construction of many jails is so faulty, that there are many cells which it is almost impossible to ventilate, and in these, even after removing all the bedding, &c. in them, there remains a peculiar and very disagreeable, and no doubt unhealthy odour. I found that this odour was quickly removed by waving in the air for a few minutes a flannel cloth wet with the diluted Burnett fluid. Over the floor a little of it may be also sprinkled.

5. The atmosphere of crowded barracks, and of the densely-peopled betwixt-decks of transports and emigrant ships, may be purified in the same way as the above.

6. When the diluted Burnett fluid (1 to 60) is applied by sponging to the persons of typhus patients, it removes the peculiar odour emitted by such patients. Except where cold sponging is indicated, the fluid ought to be used of the temperature of the patient.

7. In hospital wards full of typhus and dysentery cases, the air becomes exceedingly impure, and in cold weather and at night ventilation often cannot be had recourse to. In such cases, the disagreeable odour is removed by waving flannel cloths wet with the diluted fluid (1 to 40) two or three times a day, for a few minutes at a time, and by sprinkling some fluid on the floor.* Where dysentery prevails, a small quantity of the fluid may be poured into the utensils in the evening. The odour emitted from the surface of the body of a dysenteric patient is much lessened, or, if frequently done, is entirely removed, by sponging him with tepid diluted fluid (1 to 60). I found that, having the fluid used once a day, in the way of waving and sprinkling, when the same process was gone through next morning, there was no disagreeable odour, or almost none perceptible. This, too, was in badly-ventilated wards, crowded with typhus and dysentery patients.

I found that one ounce of the strong fluid (making 41 ounces of the diluted fluid) was sufficient for every ten persons. The price of the Burnett fluid (as at present advertised) is 3s. sterling a quart, or a penny an ounce; so that, to give the sick the daily benefit of having the fluid used, it would cost an hospital 10d. a day for 100 sick, and 8s. 4d. for 1000 sick. The expense of any article for hospital use on the large scale is an important consideration, and, besides the great superiority of the Burnett fluid in other respects, it is much cheaper than chloride of lime and other agents used for similar purposes as these are usually sold, and considering the comparative quantities of them that are requisite. As for the Ledoyen fluid (not to speak at present of the radical error its proposer made, in taking such a poisonous substance as lead for a base), I believe it is advertised for sale at 6d. sterling for a bottle containing about 18 ounces, while the same sum will purchase about 246 ounces of the diluted Burnett fluid.

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* A floor ought not to be washed with *soap* and water immediately before using the Burnett fluid.

Nearly all the medical practitioners of Montreal and Quebec have made trial of, and are completely satisfied with, the antibromic powers of the Burnett fluid.

III. *Of the Disinfecting Properties of the Burnett Fluid.*

Some of our best medical authorities* do not agree in the meaning they appear to attach to the word *disinfect*, some restricting it to an action on infectious miasm, and others apparently extending it to an action on offensive odours not in any way connected with infectious miasmata. By a disinfecting substance, I understand one which either (1.) destroys infection, or (2.) greatly lessens its intensity.

The question of infection is one of the most subtle and difficult in medicine, and has called forth the most decided and opposite opinions from writers on the subject of fever. As infection is known only by its effects, and eludes any attempt to subject it to experiment, it is, in consequence, allowable to call in the aid of theory, as long as this is reasonable, and not at variance with facts. As Professor Alison observes, "if hypotheses are introduced sparingly, and the grounds on which they rest fairly stated, they are admitted to be part of the process by which the knowledge of the truth is attained, even in the most strictly inductive sciences; and those who profess to reject and despise them are not those whose opinions are the most exempt from their influence." (*Physiology, Preface.*)

According to Liebig,† ammonia is always generated in sick-rooms, and particularly so where the disease is infectious; he also considers that this ammonia is the vehicle of the infectious principle, and what renders it volatile, so that if the ammonia be removed, the infectious essence ceases to act. By freely using the chloride of zinc solution in a sick-room, the ammonia becomes muriate of ammonia, and the air of the apartment is, according to this theory, completely disinfected. This is presuming that all the air in the room has been brought under the action of the chloride of zinc solution.

If the chloride of zinc has not been sufficiently used, there may still remain some infectious principle, but in a degree much less intense; so that, to take a crowded typhus-ward, instead of many visitors to it being attacked, and this with a severe form of the disease, only a few are attacked, and that slightly.

We may also theorize on the effect of the fluid on the patients themselves. We suppose, for example, a person has received a dose of infection, giving him typhus fever; he is then placed in a crowded typhus-ward, where he and the others are constantly emitting infectious miasm from their lungs and the surface of their bodies; this is respired by them over and over again, so that, instead of one, there are two chances against them; instead of the original quantity of infection to which they were exposed, they continue to inhale additional doses of it during their illness. Now, if by using the Burnett fluid, we wholly or even only partly remove the typhous principle in the air, we are giving the sick a better chance of recovery. Likewise during convalescence, if the atmosphere in the ward be tolerably pure, the digestion and appetite of the patients improve much more rapidly than if the air be foul; their strength returns more quickly, and their period of convalescence is of much shorter duration; they run less risk of a relapse, and the hospital gains their beds to accommodate new patients.

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* See Copland's Dictionary of Medicine; Brown in Cyclopædia of Medicine; and Dunglison's General Therapeutics, Philadelphia, 1846, vol. ii. p. 375.

† Chemistry applied to Agriculture and Physiology. Edited by Playfair. Chap. 13.

By using the Burnett fluid, the medical attendants, students, and nurses are either protected from infection, or at least run much less risk of being taken ill.

If we had a fever-hospital throughout the whole of which the Burnett fluid was daily used, and if physicians, students, and nurses, who had not had typhus, continued for four or five months to visit without being taken ill, this might be considered a proof, that the fluid perfectly destroyed infection. To use the fluid in part of the hospital only would not be sufficient, as air from the non-fluidized wards might be admitted, or the nurses might be visiting them, and be there infected. In the past season I had not an opportunity of making a trial like the above, as, generally speaking, the physicians and nurses had already had fever.

In the autumn of 1847, in the Quebec Marine and Emigrant Hospital, I had the Burnett fluid used (latterly) in seventeen wards and sheds containing 317 patients (of whom about two-thirds were ill of fever, and one-third of dysentery), being more than one-third of the whole number of patients in the hospital. When I began using the fluid in them, these wards were the worst in the hospital for offensive odour, bad ventilation, &c. Half of them were in the stone building, and the others in the sheds. With regard to other circumstances they were situated similarly to the non-fluidized wards and sheds. I daily noted the number of deaths in the fluidized wards, and compared this and the number of sick with the total deaths and total sick in the hospital, as published weekly in the papers. Thus, for the week ending 4th September, in the wards where the fluid was used, there was one death in about every fourteen cases; and in the wards where the fluid was not used, there was one death in about every nine cases. On account of having to be occasionally absent from Quebec for a day or two, I was unable to note daily for any great length of time continuously the mortality in the fluidized wards; but I have no reason to doubt that, during the whole time the fluid was used, the number of deaths was less in those wards than in the others, and in a degree somewhat like what is stated above. The difference is one too great to have depended on accidental circumstances, and I do not see to what it can be attributed except to using the chloride of zinc solution. It was not till the middle of January that I compared the mortality in the fluidized wards with that in the other wards, when I was delighted to find that my exertions had been attended with such beneficial results. If we suppose the case of a fever-hospital, throughout the whole of which the fluid had been used, and that, after this, the mortality became less, some might say that this arose from the disease becoming milder; but, in the instance given above, the experiment is more exact; the trial is clearer, and the mortality in fluidized wards is compared with that in non-fluidized wards between the same dates.

IV. Chloride of zinc has been exhibited internally[*] in chorea, epilepsy, neuralgia, &c., in very small doses of a grain and less two or three times a day.

V. In surgery chloride of zinc is occasionally used. I lately saw a case of lupus, where the Burnett fluid was found as effectual and more convenient than the solid chloride of zinc. The Burnett fluid diluted (one to 130 parts of water) has been found very beneficial as an application to chronic and scrofulous ulcers by Dr Allan, Mr Erasmus Wilson,[†] and others; and in mercurial sore-throat by Mr Flynn.[†] The diluted fluid (one to sixty or eighty) is an excellent lotion in erysipelas, and as a lotion or bath in psora, prurigo, pruritus, and other cutaneous diseases. The fluid of the full strength, or with an equal part of water, and introduced on the point of a pen into the cavity of a tooth, is a good remedy in some cases of toothach. Diluted one to 140, it removes the fœtor from mortification taking place, as after frost-bite. I have no doubt it will be found a good remedy, diluted one to 140, as an injection in fetid otorrhœa, and as a gargle in some throat diseases; it has also been used as an injection in gonorrhœa. The action of the diluted fluid on cancerous and other sores is twofold; it removes the fœtor, and it also improves the action of the sore in some alterative manner.

VI. *Of the Burnett Fluid as compared with some other agents employed or recommended for similar purposes.*

1. Producing sulphurous acid by the combustion of sulphur has been employed for purifying the atmosphere.

2. Pouring sulphuric acid on nitrate of potass, and producing

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[*] See Pereira's Materia Medica, London, 1842, p. 820; Dunglison's New Remedies, Philadelphia, 1846, page 600; and Wood and Bache's United States Dispensatory, Philadelphia, 1847, page 1215.

[†] Reports on the Solution of the Chloride of Zinc, London, 1847.

nitrous gas, is a method recommended by Dr Johnstone and Dr Carmichael Smith, the latter of whom received a parliamentary grant of L.5000 for his suggestion. The odour of sulphurous gas and also of nitrous gas is disagreeable, and in some diseases inhaling them is injurious.

3. Producing chlorine gas with manganese, common salt, and sulphuric acid is troublesome and disagreeable, and making it with oxymuriate of potass is the same. The use of the chloride of lime is attended with the inconvenience of making white spots on carpets, floors, furniture, or any other surfaces to which it is applied. It likewise changes colours, and it is corrosive. The inhalation of chlorine gas is disagreeable to most persons, and in some chest diseases it is injurious. So that among the mixed cases in a large hospital, its general employment is inadmissible. The diluted Burnett fluid is preferable to all the above agents, as it is easier of application, and while it destroys odours, it is itself odourless. Likewise, it does not injure the colour or texture of cloth; on the contrary, it is largely used for the preservation from decay of cloth and wood. In Her Majesty's dockyards, canvas and timber are immersed in it, and these articles are found to last much longer than others.

4. *Of the Burnett Fluid as compared with Ledoyen's Fluid.*—As Ledoyen's disinfecting fluid is a solution of the nitrate of lead, it is, like other preparations of lead, liable to produce one or other of their long-known bad effects, such as colic, pain in the course of the spine, palsy, giddiness, coma, apoplexy, constipation, indigestion, wasting of the muscles and of the body generally, and permanent decrepitude. Likewise, employed in typhus, according to the Ledoyen method (by means of wet cloths over the person) it is apt to produce a sedative and depressing effect, which is the exact opposite of what is required in that disease. In Dr Hall's Brit. American Journal for March 1848, two cases of lead-colic, arising from Ledoyen's fluid being applied to ulcers, are mentioned. In the case of Mr R. (at Lachine, near Montreal,) where there was sloughing of the hands after frost-bite, Dr Nelson informs me, that Ledoyen's fluid was applied on account of the fœtor, and this was followed by frequent, painful, and nearly ineffectual attempts at defecation, and by other signs of intestinal disorder. At Quebec, there were three cases of typhus in which the two proprietors of Ledoyen's fluid used it largely. Cloths wet with it were kept applied to nearly the whole surface of the body, and other wet cloths were suspended over the bed, and in the room. These three cases were, I believe, the only instances in Canada where the Ledoyen fluid was much applied to individual patients ill of typhus, and in them it was considered to have a depressing effect. The three cases terminated fatally.

The two proprietors of Ledoyen's fluid asserted that their fluid prevented one from taking typhus, and also that it certainly cured any one already ill of that disease.

The fact of both of them being seized with typhus is so far a contradiction of their first assertion; and the fact of one of them unfortunately dying of typhus is so far a contradiction of their second assertion. This last case is one of the three alluded to above, where the Ledoyen fluid not only did no good, but where it probably contributed not a little to the fatal event. Some may say that this case ended fatally because the patient was 70 years of age; but the ages of the other two patients treated with Ledoyen's fluid were, I believe, 35 and 38.

The Ledoyen fluid acts as a corrosive; and I heard of two instances (Montreal General Hospital, and Dr James Douglas's house in Quebec) where water-closets were injured and made leaky in consequence of a quantity of it having been thrown on them. I saw some tin vessels full of holes in consequence of the fluid having been left in them for some time. In Quebec, it was found to injure the texture of cloth, so that sheets, pillow-cases, and towels that had been wet with it, were rendered nearly useless. I witnessed several comparative trials of the two fluids with regard to their power over feculent odours, and in all of them I considered that the Burnett fluid had much more effect than Ledoyen's. In Montreal, some of each fluid was added to a quantity of feculent matter in a couple of vessels; a few minutes after, feculent odour had a good deal disappeared from the L. vessel, from which there came a slight nitrous odour; from the B. vessel odour had almost entirely disappeared. The vessels were kept, and a week after, I looked at them. On the B. vessel being stirred, there was no odour. On the L. vessel being stirred the odour was nearly the same as it was before the fluid was added.

In Quebec, Dr Painchaud, senior, of the Marine and Emigrant Hospital, wrote out an excellent plan of testing the comparative deodorizing powers of the Burnett and Ledoyen fluids, by which the judges were to give their opinions, unconscious of whose fluid it was in favour of which they were voting. The result of this trial* was in favour of the Burnett fluid, and it afforded no little amusement to the other umpires, and caused no small vexation to himself, that Mr Ledoyen's zealous and enthusiastic colleague voted (of course unconsciously) against *their* fluid. Mr Ledoyen himself conducted his own part of the trial, while I experimented with the other fluid, and neither of us voted.

Dr Pereira,† after enumerating the various medicinal and the poisonous effects of the preparations of lead, describes each preparation separately, and of the nitrate of lead observes, that "its general effects are similar to those of the other soluble salts of lead."

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* The account of which, with the signatures, is published in full in the *Montreal Courier* of 20th October 1847, and in other Canadian papers; also in the *Edinburgh Medical and Surgical Journal*, vol. lxix.; the *London Medical Gazette* of 26th November; and *Dublin Medical Press* of 8th December. One or two periodicals erroneously supposed the judges in this trial considered they were experimenting on something more than the *deodorising* properties of the fluids.

† Materia Medica, London, 1842, page 805.

A non-professional reader glancing at these pages might think that as he has heard of lead preparations being employed as internal medicines, Ledoyen's fluid cannot be very objectionable; but he may be informed, that when a lead-preparation is prescribed internally, it is in small doses, in some diseased state such as internal hemorrhage, &c. where a sedative and astringent remedy is peculiarly suitable; where its effect is daily watched by the medical attendant, and new directions, if necessary, given for its use, and where, also, it is combined with opium or some other medicine to prevent its producing its objectionable effects, which, however, sometimes appear, notwithstanding all possible precautions.

Far different, however, is the method which the proprietors of Ledoyen's disinfecting fluid recommend for using their solution of the nitrate of lead. They think that it ought to be used indiscriminately by the public generally, and without any precautions. Nor would it be a sufficient defence of its use to say, that the nitrate of lead acting on the ammonia in the feculent matter or in the atmosphere, and so becoming nitrate of ammonia, no bad consequences could ensue; as any remaining nitrate of lead not decomposed by the ammonia, might, and most likely, would, go on to produce one or other of its poisonous effects. While Ledoyen's disinfecting fluid is so objectionable on account of being a solution of a poisonous salt, Burnett's disinfecting fluid, the solution of the chloride of zinc, is formed of a base which is perfectly innocuous. Wood and Bache* say of the chloride of zinc, that "it has the advantage of not giving rise to constitutional disorder from absorption."

In conclusion, there appear to be just grounds for stating that the general use of Ledoyen's fluid is unsafe, and if used by the public indiscriminately, it would most likely, very frequently, do much harm.

Next to perfect ventilation, I would place the use of Burnett's solution of the chloride of zinc. On many occasions, as in badly-constructed buildings, in cold weather, and on boardship in stormy weather, ventilation is impracticable, and recourse must be had to some other means of improving the quality of the air, and it appears to me that the chloride of zinc solution is much superior to all the other artificial methods of doing so, including Ledoyen's solution of the nitrate of lead.

MONTREAL, CANADA,
10*th May* 1848.

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* United States Dispensatory, Philadelphia, 1847, page 1215.

SIR WILLIAM BURNETT'S DISINFECTING FLUID.

PURPOSES AND METHOD OF APPLICATION.

OBJECTS.	MODE OF APPLYING THE FLUID.	PROPORTION OF MIXTURE. Fluid.		Water
To purify Sick Rooms and the Wards of Hospitals, Work-Houses, Prisons, Factories, and Crowded Places, the between-decks of Ships, &c.	Moisten, with the diluted Solution, a piece of flannel-cloth attached to a long rod, and wave it through the air of the apartment for ten minutes at a time—in addition to which the floor should be mopped or sprinkled over with the same, if necessary, several times a day, and a small quantity of the same dilute Solution should be put into the close-stools and bed-pans. The water-closets should also be cleansed with it, and a couple of gallons occasionally thrown down each, - - -	1	to	40
To purify Fever Wards, in cases of death.	When a patient dies of fever, the body should be sponged over with the dilute Solution, and the clothes and bedding should be immersed and kept in a sufficient quantity of it for forty-eight hours before being washed. The floor should be well mopped over with the Solution. Flannel, moistened with it (as before recommended), should be waved through the room, - - - - - -	1	to	40
To purify the Clothing, Linen, &c. of sick persons.	Immerse the articles in the dilute Solution, as directed in sick rooms, - -	1	to	40
To prevent the communication of Infectious Disease.	Sprinkle the dilute Solution over the whole of the floor of the apartment, and very slightly on the coverlid of the patient's bed. The clothes used should be immersed in the Solution, and afterwards thoroughly dried. Moisten pieces of flannel cloth, and use them as directed above, - - - - - -	1	to	40
To purify the odour of Night-chairs.	Put half a pint of the dilute Solution into the pan previous to its use, and when emptied, rinse it out with a small quantity, - - - - -	1	to	40
To disinfect Dead Bodies, and purify Apartments, preparatory to the visits of Searchers, Undertakers, and Jurymen, and in cases of Dissection and Post mortem Examination.	Wash the body occasionally with the Dilute Solution, which will remove all unpleasant small, and retard putrefaction, - - - - - -	1	to	40

To prepare and arrest the decomposition of Subjects for Dissection.	Immerse the subject in the dilute Solution, and let it remain about two hours, after which time it will be purified. As the dissection proceeds, the parts should be sponged over with the same; and, if they are to be preserved, the blood-vessels should also be injected with the Solution,	1 to 40
To disinfect Cess-pools, Drains, Water-closets, &c.	Pour in a quantity of the Solution in proportion to the capacity of the receptacle. For ordinary water-closets, one gallon of the dilute Solution will generally be effectual. For large cess-pools the quantity must be increased in proportion to their contents,	1 to 20
To purify Stables.	Sprinkle the floor and wash all the wood-work with the dilute Solution,	1 to 20
To sweeten Musty Casks, Tubs, &c.	Rinse them well with the dilute Solution,	1 to 20
To destroy Canker or Fungus in Trees.	Apply the Solution with a brush to the parts affected only,	1 to 20
To extirpate Bugs and other Vermin.	Wash the floors and all the crevices with the dilute Solution,	1 to 20
	The joints, &c. of the bedsteads should be moistened by a brush with a Solution consisting of *one* part of fluid to *five* parts of water.	
To purify Bilge-water and the Holds of Ships.	The quantity to be used at a time is twenty gallons of the dilute Solution for each hundred tons of the ship's measurement. It should be poured into the air holes of the ship, so that it may find its way by the limber-holes into the well; and it should be thrown by a small engine into places where it may be inconvenient to introduce it by other means. A portion may also be poured down the ship's pumps, the boxes being previously removed to allow its free passage below. The Solution should be allowed to remain in the ship twenty-four hours. At the expiration of that time, the ship should be pumped as dry as possible, the well thoroughly cleansed and washed with the Solution, and the operation repeated as occasion may require,	1 to 20
For sponging the person in Fever cases.	Use the Solution either cold, or of the temperature of the patient,	1 to 60

N. B.—When floors and other wood-work are washed with the Solution, the use of soap or soda should be avoided immediately before or after its application.

ART. III.—*On the Ganglionic System of Nerves.* By C. RADCLYFFE HALL, M. D., Fellow of the Royal College of Physicians, Edinburgh; M. R. C. S., Eng. Part Seventh.

On the Ganglia of the Fifth Nerve. Second portion, containing the Ganglia of the Ear, and general summary.

THE ganglia of the ear are two, and both of the sympathetic class. The one, which belongs to the internal ear, is small and fusiform, and scarcely acknowledged by most anatomists to be ganglionic. The other, which belongs to the tympanum, is analogous to the ciliary and the spheno-palatine, and is of the distinct kind.

The synonyms monopolized by Arnold's otic ganglion render it difficult to select a name, although but a provisional one, for the little fusiform ganglion found on the facial nerve, where this is joined by the superior vidian. From its presumed connection, however, with the part of the ear in which the acoustic nerve expands, it may here be described under the designation of

GANGLION ACUSTICUM.

Syn: Intumescentia Ganglioformis Nervi facialis ; renflement geniculé.

Where the *portio dura*, after leaving the auditory nerve, makes a sudden bend at the *hiatus Fallopii*, it is joined by the superior vidian nerve. Internal, and close to this point of junction, the *portio dura* presents a slightly knobbed appearance. In the prominence of the swelling are to be found ganglionic cells. The filaments for distribution are demonstrated not without difficulty. They consist of oblique and transverse threads which apply themselves to the vestibular division of the *portio mollis.*

Comparative Anatomy.—Found in all mammalia.

Connections in Man.—With the fifth nerve through the superior vidian; with the facial, on which it lies; with the glosso-pharyngeal and vagus through the continuation of the tympanic nerve of Jacobson; with the otic ganglion through the little superficial petrosal nerve of Arnold; with the sympathetic through filaments from the carotic plexus.

Analysis.—Impressional Element.—From the fifth nerve, the glosso-pharyngeal and the vagus.

Impressional Distribution.—To the membranes of the labyrinth.

Motor Element.—From the facial nerve, especially from the *portio intermedia.*

Motor Distribution.—To the membranes of the labyrinth (perhaps), and to the *stapedius* muscle, after proceeding in company with the *portio dura* for some distance.

Ganglionic Connection.—With the carotic plexus.

Ganglionic Distribution.—To the internal ear.

Use.—To associate the secretion of the endo-lymph and exolymph, or the state of vascular fulness, or both, in the internal ear,—with the state of the tympanum, through the same impressional nerves supplying both,—with impressions of a non-special character caused by the sonorous vibrations in the labyrinth itself, especially in the semicircular canals, through filaments of the three impressional nerves which contribute to this part;—with the contraction of the *stapedius* muscle, by which the stapes is pressed more tightly against the nerve-sac;—and possibly with contraction of the membranous walls of the ear-sac itself.

A connection between the facial and the acoustic nerves at the bottom of the *meatus audatorius internus* is mentioned by Kœllner, Breschet, and Swan, and is considered by Arnold as the means through which the otic ganglion is connected with the *portio mollis*. He describes "a filament which arises from the upper surface of the gangliform swelling at the bend of the facial nerve by one or two roots, passes backward across the *hiatus Fallopii* and enters the internal auditory canal, becomes applied to the acoustic nerve, and unites with it at the bottom of the meatus." Longet describes the communication differently. According to him, the connection does not take place between the *portio mollis* and the facial nerve, properly so called, but between the *portio mollis* and the *portio media* of Wrisberg,—a small nerve intermediate in course and origin to the other components of the seventh nerve. Of this *portio intermedia* he gives the following account.

"Its radicles, two or three in number, appear at their origin to be confounded with the facial; but presently they adhere to the acoustic nerve, and especially to its vestibular branch, from which they separate at the bottom of the auditive canal, to unite afresh with the facial, and to connect themselves with it in the internal opening of the aqueduct of Fallopius. I hesitate not to affirm that these filaments of the *nerf intermediare* pass *from* the vestibular branch of the acoustic *to* the facial, and I cannot with some consider them as real anastomoses between the two. Subsequently, the nerve appears in part to remain distinct from the facial, and ultimately to give origin to what I call the little petrosal nerve, which, after traversing the otic ganglion, supplies the internal muscle of the malleus. I suspect that another part of the intermediate nerve animates likewise the muscle of the stapes. Consequently, this nerve seems to move the muscles of the middle ear, and furnishes the motor root of the otic ganglion, much as the common motor oculi nerve moves the greater part of the muscles of the eyeball, and furnishes the motor root of the ophthalmic ganglion; from this consideration, it appears to me to merit the name of the tympanic motor nerve."*

Bischoff, Gœdechens, and Barthold, on the contrary, view the *portio intermedia* as the sensational root of the facial nerve, consider that the ganglionic swelling in the *hiatus Fallopii* belongs exclusively to its filaments, and view this as a proper spinal ganglion. On physiological grounds this conjecture would be highly improbable, and anatomy at once proves it to be erroneous. It is very difficult to demonstrate the minute connections of the *ganglion acusticum*, but it is not at all difficult to show that the ganglion itself is not a spinal ganglion. We have no sensational nerve without a spinal ganglion on its roots, and the *portio intermedia* certainly presents no ganglion nearer to the brain than the one in question.

Viewing the *portio intermedia* as composed of filaments of the facial nerve, it does not seem improbable that those filaments which are destined to animate certain allied muscles, may be packed up together, constituting a fasciculus more or less distinct from the rest. Hence Longet's supposition appears to myself sufficiently plausible. There is, however, more of anastomosis between the facial and the acoustic nerves than he allows. Filaments may be seen very plainly (as Mr Swan pointed out) in the lamb or the calf, which pass across the bottom of the meatus from the facial nerve to the auditory, in addition to those which pass in a contrary direction from the *portio intermedia* to the facial. These connecting filaments are presumed to come from the facial, because they pass from that nerve backwards and somewhat outwards towards the perforated wall of the internal ear, whereas the filaments which proceed from the *portio intermedia* to the facial pass forwards and outwards towards the *ganglion acusticum.*

It must be admitted, that our acquaintance with the minute anatomy of these nerves is not sufficient to permit of exact and positive physiological inferences; but if from physiological considerations it should seem probable that the membranes of the internal ear receive nerves of every kind, nerves of motion as well as of special and common sensation, the probability will not be lessened on anatomical grounds.

The presumed physiology of this ganglion will be considered with that of the next.

GANGLION OTICUM.

Syn: Auriculare; Maxillo-tympanic: first described in full detail by Arnold in 1828; previously described more cursorily by Breschet in the same year.

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* Longet, Anatomie et Physiologie du Système Nerveux, T. ii. p. 411.

Comparative Anatomy.—Not found in fishes, reptiles, or birds. Amongst mammals, as a general rule;—in herbivora, it is large, flat, and radiated in appearance, sending out a tail-like prolongation along the buccal nerve; in carnivora, small, round, and nodulated. Arnold observes that this ganglion is large, and intimately connected with the ear, in proportion as the external ear is large and well developed. It is even double in animals which possess a very large and moveable external ear, such as the hare, rabbit, pig, and horse. Other animals which have the external ear of large size have also the otic ganglion large though single. This is the case in the ox, sheep, deer, and goat. Smaller when the external ear is middle-sized, as in the cat, dog, pole-cat, hamster, and rat, the otic ganglion is least of all in animals which are devoid of any external ear, as the mole.

When the otic ganglion is double on each side, the posterior ganglion furnishes the filaments to the *tensor tympani*, to the *ganglion acusticum*, and to the temporo-auricular nerve; the anterior ganglion those which join the pterygoid, masseteric, and buccal nerves.

There is some difference in the relative extent to which the ganglion contributes to these several nerves; thus, in the pig, the supply of filaments to the temporo-auricular nerve far exceeds that sent to the masseteric; whilst in the horse, sheep, deer, and goat, the supply to the masseteric nerve is large; to the temporo-auricular very small.

Arnold does not particularly allude to the contribution sent to the buccal branch of the fifth nerve, which is in some animals the most distinct and evident of the distributed filaments, and has been especially noticed by Breschet.

Connections in Man.—The otic ganglion receives filaments from both the sensational and the motor divisions of the infra-maxillary nerve, from the facial nerve, the tympanic plexus, and the sympathetic. It furnishes filaments to the *tensor tympani* and tympanum, to the pterygoid, masseter, and buccal nerves, and to the temporo-auricular nerve.

Analysis.—Impressional Element.—From the fifth, by its connection with the sensational division of the infra-maxillary nerve; from the glosso-pharyngeal and the vagus, through the "little superficial petrosal nerve" of Arnold, which comes from the tympanic plexus, and likewise through the "lesser petrosal" from the *ganglion acusticum.**

Impressional Distribution.—To the Eustachian tube, tympanum, and *meatus auditorius externus* at the part near the *membrana tympani;* to the mucous lining of the cheek.

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* Vide Pl. xi. Fig. 31 (14).

Motor Element.—From the motor division of the fifth; and from the facial at its *ganglion acusticum* through the medium of the "lesser petrosal nerve."*

Motor Distribution.—To the *tensor tympani;* to the temporal masseteric, pterygoid and buccal muscles, and to the *tensor palati.*

Ganglionic Connection.—With the superior cervical ganglion through the medium of *nervi molles*, which accompany the middle meningeal artery.

Ganglionic Distribution.—To the mucous membrane of the Eustachian tube and tympanum; to the bottom of the *meatus externus*, and to the ceruminous glands there imbedded (through the medium of the contribution from the otic ganglion to the temporo-auricular nerve); to the faucial mucous membrane around the mouth of the Eustachian tube, and to the cheek.

Use.—To associate the secretion of the mucous membrane of the tympanum, Eustachian tube, adjoining part of the fauces, and of the cheek, and the secretion of cerumen in the outer ear, with impressions made on the same parts on the one hand; and with the contraction of the *tensor tympani*, the *tensor palati*, the muscles which close the jaw, and the buccinators, on the other.

Physiology and Pathology.—The otic ganglion is considered by Arnold as "the centre which presides over the automatic movements of the tympanum." He thus explains the mode in which the assumed excito-motory action takes place. "Sonorous waves excite disagreeably the expansion of the auditory nerve; this impression is communicated through the anastomosis of that nerve with the facial to the latter, and through the connection of the facial with the lesser petrosal to this nerve, and through it to the otic ganglion, which, in conformity to the impressions it thus receives, reacts on the tensor muscle of the tympanic membrane, in such wise that this membrane is tightened in proportion to the intensity of the sound." The inexactness of this explanation at the present time is sufficiently apparent, but the idea on which it is founded must be dealt with less summarily.

The reasons which induced Arnold to invest his newly-found ganglion with the office of motor centre for the *tensor tympani*, and in so far (*parva componere magnis*) to anticipate the precise theory of reflex spinal action, may be considered under the heads of anatomy and analogy.

To commence with the latter;—great stress is laid upon the analogy of the otic to the ophthalmic ganglion, which is viewed "on several grounds founded on anatomy and pathology, to be the central organ of the activity and of the automatic movements of the iris." In like manner, the otic ganglion is considered to be the motor centre for the defensive muscular movements of the ear;

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* Vide the same plate (15).

the spheno-palatine ganglion for those of the nose; and the ganglion of the submaxillary gland for those of the mouth. Whatever speciousness might be awarded to this assignment as regards the eye and the ear, bearing in mind that the functions of the spinal cord had not then been defined, there was little in the case of the nostrils and mouth. Sneezing was supposed to be excited through Meckel's ganglion, the carotic plexus, and the phrenic nerve, thus constituting the little ganglion a motor centre for the diaphragm! The defensive act for the mouth, consisting in the free pouring out of saliva, was ascribed to motor reaction of the submaxillary ganglion on the excretory ducts of the submaxillary gland, leaving the increased excretion from the larger salivary gland unaccounted for. To an argument from analogy, when correctly drawn with sufficient attention to *all* the facts, great deference is due. In physiology it is ever a potent argument, equally good to confirm or refute a conjecture. In proportion as it fails to support, it always serves to oppose. And it does so here. The inadmissibility of the assignment of motor superintendence to the several sensorial sympathetic ganglia referred to, renders the possession of any such power by the otic ganglion extremely improbable.

The anatomical arguments must be discussed seriatim.

(1.) "The connection of the otic ganglion with the *tensor tympani* is marked and constant." This indicates a close physiological connection between the ganglion and the muscle, but not the nature of that connection. It is therefore no proof of the ganglion being the centre of motor energy for the muscle.

(2.) "The otic ganglion exists in those animals only which possess a *tensor tympani*." This allows merely of the same inference as the preceding.

(3.) "The *tensor tympani* never exists without an otic ganglion." If correct, this fact would possess no greater significance than the first two. But not only is it yet unestablished; it is probably quite incorrect. Birds and reptiles possess an internal muscle of the tympanum, which is considered to be the homologue of the *internus mallei* in mammals, but which, from the different direction of the convex aspect of the *membrana tympani* in birds and reptiles, is supposed by Arnold and some others to be a relaxing and not a tightening agent for the drum-membrane. Reasons will presently be adduced for entertaining a different opinion; but, even supposing with Arnold, the muscle to be a laxator and not a tensor, the relaxing action would be just as much an automatic movement of the ear, just as responsive to the requirement of the sense as the tightening action, and would seem equally to require a special centre.

(4.) "The development of the otic ganglion corresponds with the size and mobility of the external ear." This circumstance merely indicates, that when the sense of hearing requires an outward apparatus unusually moveable, it also needs an unusual amount of the influence exercised by the otic ganglion, be that what it may.

(5.) "In ruminating animals, the connection between the nerves of mastication and the otic ganglion is very marked and considerable." This interesting fact points to some direct association between the contraction of the elevating muscles of the lower jaw and the action of the otic ganglions, but it discloses nothing as to the nature of the association. The purpose fulfilled is doubtless that which Arnold points out, although the end is not, I believe, effected in the mode he implies. "The branches," he observes, "which go to the masseteric, temporal, and pterygoid muscles are of importance to the acoustic organ; they are connected with the otic ganglion, not only by this receiving many short filaments from the lesser portion of the trifacial, but also by the pterygoid nerve passing through the substance of the ganglion. The relation of these nerves with the auditive organ is shown by this, that when by the action of the abovenamed muscles the condyle of the lower jaw is pressed against the inferior wall of the cartilaginous portion of the *meatus auditorius externus*, this passage is slightly contracted, and thus the transmission of sonorous rays diminished. The phenomenon frequently observed that the masseter muscles contract when overloud sounds strike the ear, is explained by the anastomosis of the otic ganglion with the lesser portion of the fifth pair; the contraction of these muscles has for its object to moderate the action of sound upon the acoustic nerve." Arnold does not state expressly the manner in which this is accomplished; but, from the context, it is to be inferred that he supposes it to take place as follows. The excitement produced by sound in the acoustic nerve is propagated through it to the *portio dura*, and through the *portio dura* to the otic ganglion, whence a motor influence is reflected simultaneously on the *tensor tympani* and the maxillary muscles. The otic ganglion, by its reflex operation inducing contraction of these muscles, without any prior conduction of the sonorous impression to either brain or chord. It is a sufficient objection to such a view, that we have no evidence that the phenomena are ever presented in the absence of cerebro-spinal, or, at all events, of spinal activity. Moreover, the filaments which pass *through* the otic ganglion to the muscles are supplied with motor power at their origins in the spinal chord, rendering a second excito-motory centre superfluous; and the filaments which arise in the ganglion are gray only, of which the motor endowment is opposed by all we know concerning them.

Arnold refers to the connection between the glosso-pharyngeal and the vagus nerves, and the otic ganglion, as supporting the general analogy between the ear and the eye. The long root of the ciliary ganglion arises from the same spinal ganglion (the Gasserian,[*]) which supplies the lacrymal gland. The long root of the otic ganglion arises in the same spinal ganglion (the *ganglion petrosum* of the glosso-pharyngeal, and through its filaments of connection virtually from the ganglion of the vagus also) which supplies the ceruminous glands of the *meatus auditorius externus;* "the glands of the cerumen evidently corresponding in their nature to the lacrymal gland." It is here implied, although nowhere stated, that the purpose for which a contribution proceeds from the eighth nerves to the otic ganglion is that of associating the ceruminous secretion with the muscular acts assumed to be presided over by the ganglion; consequently, Arnold's definition of the function of the otic ganglion is more limited than his opinion. He seems really to have viewed it not only as "the central organ which presides over the automatic movements of the drum-membrane," but indirectly, through the medium of the *ganglion petrosum,* over the secretion of the ear-passage likewise. The same vague reference to nerve-anastomosis as an adequate cause for sympathetic movements independently of cerebro-spinal action, which vitiates many of the older doctrines on the subject, obscures the physiological explanations of this otherwise very clear and accurate writer. In the point before us, the analogy could hold good only with respect to the vagus, since the contribution to the otic ganglion from the glosso-pharyngeal proceeds from the sympathetic, and not from the spinal ganglion of that nerve, whereas from the vagus it does proceed from the first or spinal ganglion.* It is doubtful, also, whether the ceruminous glands do not derive their principal supply of organic nerves from the common source for the sensorial outworks,—the Gasserian ganglion, through the medium of filaments from the temporo-auricular branch of the fifth, having their secreting activity also associated, it may be, with excitement in any of the ganglia from which they derive nervous filaments, viz. the ganglia of the glosso-pharyngeal and the vagus, the otic, and the superior cervical ganglion.

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[*] The ganglion of the fifth nerve is styled by modern writers Casserian, or Gasserian, indiscriminately. Arnold correctly writes Gasserian. The confusion has arisen from two anatomists having possessed a very similar name. Julius Casser of Placenza published two works at the beginning of the seventeenth century, viz. "De Vocis Auditusque Organis, &c. Ferraræ, 1600," and "Pentæstheseion, hoc est, de quinque Sensibus, libr. x. Venetiis, 1609." As Gasser, the real "Simon Pure," did not publish any work that has been handed down, the title of the ganglion was by some not unnaturally ascribed to the earlier anatomist. Gasser was professor at Vienna some time between 1748 and 1765. Hirsch, who was a pupil of Gasser, writing in 1765, in his description of his plate of the fifth nerve, styles the ganglion "Semilunar, or, *from the discoverer of its internal structure, Gasserian.*" And Wrisberg, in 1777, also states, that the ganglion is by many anatomists named in memory and honour of Professor Gasser of Vienna, "although," he proceeds to state, "the view promulgated by Gasser was by no means new at the time," in proof of which he refers to Meckel's treatise, "De Quinto Pari," published at Gottingen in 1748. It is clear, therefore, that Julius Casser, who lived a century and a-half before, was not the anatomist whose name the ganglion was intended to bear. It is equally clear that Professor Gasser will have handed down his name in connection with the Gasserian ganglion rather by good fortune than by right. Vieussens (Lyons, 1685,) appears to have been the first to describe the swelling on the trifacial nerve as "plexus gangliformis." Winslow (Paris, 1732,) similarly designated it. See also Prochaska, *Opera Minora*, 1800. Pars i. p. 378.

Having cursorily discussed the grounds assigned for considering the otic ganglion an excito-motory centre for the *tensor tympani*, and found them insufficient to establish such a conclusion, we may proceed to notice a few reasons which appear strongly opposed to it.

(1.) Birds and reptiles have an involuntary muscle for the columella, which is probably a tensor. It is certainly the only muscle which corresponds to the *tensor tympani* of mammalia,—and yet have no otic ganglion.

(2.) The white filaments to the *tensor tympani* may be traced through the ganglion into the *portio minor* of the fifth.

(3.) The nerve to the *tensor tympani* does not exceed in size either the lesser petrosal, or the contribution to the temporo-auricular; hence the ganglion cannot be *solely* for the use of the tympanic muscle. An inference also deducible from the bipartition of the ganglion in certain animals, as before stated.

(4.) In some animals the contribution to the buccal nerve is a semitranslucent tail-like process from the ganglion, consisting largely of grey filaments. Of the use of this the view in question would afford no explanation.

(5.) As the ophthalmic ganglion has been proved not to be an excito-motory centre for the eye, the otic is presumed not to be one for the ear; and the analogy of all other ganglia likewise, as far as is known, is against such a view.

As in the eye, the means of adjustment to variation of light and to distance of objects consist in an altered condition of the media through which luminous rays have to pass, and in an altered distance between the outworks and the nerve-screen, so also in the ear, the acoustic nerve is fitted for correctly appreciating sounds which vary greatly in their pitch and strength, by an altered condition of the media through which sonorous vibrations are propagated, and by an altered distance between itself and its outworks. The eye undergoes tension of its coats and densification of its contents. The ear undergoes tension of its membranes and densification of the air contained within the tympanum. The eye undergoes change in its long diameter. The ear undergoes change in the distance between nerve and outer membrane.

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* Plate xi. fig 31, (Nos. 10, 17.)

By an alteration in the density of the air contained in the tympanum, its power of conducting sound is modified. By muscular contraction, the drum-membranes are tightened and have their vibratibility impaired; and by the tension induced in these, the distance between the auditory nerve and its outer drum-membrane may undergo some trifling change.

Differing so completely in many respects as do light and sound, they still possess some characteristics in common. Indeed, so far as their operation can be reduced to mechanical laws, there is much resemblance between them.* In conformity with Nature's usual plan, rather to adapt an existing scheme than create a new one for the fulfilment of offices in any respect allied, we find a marked though broad analogy between the eye and the ear, so plain, indeed, that what has been ascertained respecting the one may reasonably be deemed suggestive concerning the other.

The only essential organ through which sonorous undulations must pass before they can make an impression on the nerve of hearing is simply a bag full of fluid. The auxiliary parts of the organ vary according to the medium in which the animal lives. In all air-breathing animals, sounds usually originate in something either rarer than fluid (*e. g.* the voice), or denser (*e. g.* when two solids are struck against each other), and undergo some change in their intensity whenever they pass from one medium into another. The facility with which sound passes from a rare into a dense medium, or *v. v.*, is found to be greatly influenced by the intervention of an expanded membrane, and likewise by the degree of elasticity and of tension which this membrane possesses. The character of the sound itself also has a great influence on the readiness of its transmission through media which differ in density. An acute note is more readily transmitted by a tight membrane; a grave note by a slack membrane. A body, whatever its nature, conducts best the sounds which most nearly approach its own fundamental note, *i. e.* the sound which may be elicited from itself. Consequently, to render the ear a perfect acoustic instrument, it is only necessary to endue it with the power of adapting the tension of its nerve-sac to every variation of sound, whether in quality, pitch, loudness, or direction.

Taking loudness or intensity, and pitch or note, as examples, it is obvious that the means by which the organ is best fitted for appreciating high notes, will be the very means for defending it from being injured by intense noise. Just as in the eye, the compressed eyeball, contracted pupil, and half-closed lids, which fit the organ for discerning a minute and near object, at the same time shut out all that is not wanted of the excessive light required for illumination.

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* Reflection of light obeys the same laws as reflection of sound. Refraction of light is best explained on the principle of attraction,—an argument, it seems to me, for the material hypothesis.

In every special sense, the accommodating and the defensive apparatus are one and the same, heightening sensibility or obtunding it according to the requirement. In order to define the mode in which the ear is adapted for accuracy of perception under constant variations in its natural stimulus, and also armed against injury, we have only to inquire how the state of its nerve-sac is regulated. No organ presents greater diversity in its arrangement and its construction than the ear in different animals; and no organ exemplifies more distinctly unity in design and in mode of action.

In osseous fishes, having neither drum-membranes, tympanum, nor external ear-passage, the means for modifying the state of tension of the vestibular-sac and the semicircular canals are not very apparent. It is probable that but little adaptation of the ear is required. Fitted by the large size of the membranous canals, lying exposed in the oily liquid of the cranium, for receiving vibrations from an extensive surface of fluid, and by the connection of the vestibule with the bones of the head for receiving other vibrations from solid bodies, the ear is always adapted for appreciating the acute rushing sounds made by the fish or its fellows, as well as for the sounds elicited by collision against solid substances. More than this can scarcely be necessary so long as the fish keeps to nearly the same depth in the water; but on making any considerable change of depth, the capability of accommodating the ear to the altered density of the surrounding medium becomes essential.

In those osseous fishes which do not possess any swimming bladder, there is no mechanism external to the vestibule by which its condition could be influenced, nor does there appear to be any additional element proper to the vestibule or its canals by which their tension could be changed.

If we assume that the membranous walls of the ear-sac, or parts of them, possess contractility, there is no longer difficulty in comprehending how, by different degrees of contraction of the walls upon their fluid contents, different degrees of tension must ensue.* It is true that no proof of the existence of any variety of muscular tissue in the walls of the ear-sac has been furnished, but, at the same time, no explanation of the constant supply of motor nerves to the ear-sac has ever been given. It may be objected that, in the absence of manifest contractility, and of demonstrable muscular fibre, the motor character of the accessory nerves of hearing is a mere assumption; but the argument from analogy is strong on anatomical grounds. Unquestionably we never find a nerve of common sensation that is not gangliated near its root, nor a nerve purely motor that is;—the nerves of special sense are exceptions. Unless, therefore, the non-gangliated nerves furnished to the ear-sac, in addition to the auditory nerve, be so many additional nerves of special sense, they must be motor. In those fishes in which the accessory nerve proceeds direct from the brain to the ear-sac, there might be room for doubt; but where the nerve proceeds from the motor portion of the fifth, from the rudimentary facial, or from the non-gangliated division of the vagus, we can scarcely hesitate to assign to it a motory character.

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* A fact in hydrostatics familiar to the obstetrician in its relation to the bag of membranes during uterine contraction.

In the cod, the accessory nerve of the ear-bulb is a contribution from the vagus, and from that first portion of the vagus which is probably homologous with the glosso-pharyngeal. In the skate, cat-fish, and carp, both fifth and eighth nerves send a contribution to the ear. In the pike, the fifth, and probably the facial,—since a continuation from the nerve which supplies the acoustic sacculus emerges on the back part of the side of the head. In the conger eel, gurnard, and turbot, a portio dura also proceeds from the same nerve which supplies the ear-sac. In the alose, the accessory comes off from the medulla as a distinct nerve. Generally speaking, the true auditory nerve is distributed to the vestibule, and to the ampullæ of the anterior, and the external semicircular canals; whilst the accessory nerve supplies both the loculi of the sac, where the otoliths lodge, and the ampulla of the posterior canal. In *sparo salpa* and others, however, the true auditory supplies the anterior loculus. In the cat-fish, the accessory sends a branch to be distributed in the branchial muscles, the branchial membrane being supplied by the fifth. (Weber; Breschet.)

From its source in the avowedly motor nerves, the absence of ganglia on its roots, the concomitant distribution of some of its filaments to the ear-sac, and of others to muscles, and from its more especial relation to that part of the acoustic bag which contains the otolith, we may infer that the accessory nerve is for the most part a motor nerve; yet not entirely so. We should expect that so important an organ would not be devoid of impressional nerves; and these the ear-sac probably receives to some extent from the gangliated portion of either the fifth or the eighth nerves. In *Cyprus carpio*, this presumed mixed character of the accessory auditory nerve is demonstrated by the presence upon it of a fusiform ganglion. Arising in front from the non-gangliated portion of the fifth, and receiving from behind a contribution from the gangliated portion of the eighth (? the glosso-pharyngeal), the accessory nerve forms a small distinct fusiform ganglion of its own beneath the true auditory, and then supplies two nerves to the vestibule, one to the ampulla of the posterior canal, three to the muscles of the branchiæ, and one to join the branches of the glosso-pharyngeal which proceed to the branchial membrane (Weber, "*De aure anim. Aquatilium*, 1820.")

The connection between the acoustic organ and the eighth nerve, including under that head both glosso-pharyngeal and vagus, exists in all vertebrata, but to the most marked extent in the fish. We cannot suppose it to be present in man merely for the sake of supporting unity of organic type, or that it is but the necessary relic of a nerve, important only during a certain stage of fœtal life. We seek its signification, therefore, by examining it in the fish, where it is most developed. The connection between the state of the ear and that of the respiratory tract is more intimate in the fish than in any other animal. As no other sounds besides those conveyed by the surrounding fluid will ordinarily require attention, and as these must excite vibrations in the water constantly playing through the gills, it might be suspected that the same sentient nerve which supplied both ear-sac and gills was fitted for appreciating sound in both parts,—being impressed in the gills by vibrations in the water passing over them, as in the ear by sonorous waves conducted thither. Such a community of function, however, between a nerve of common and one of special sense, is forbidden by all we know concurring either. We would rather infer that the ear-sac receives filaments from a given nerve, in order that impressions made in the ear may induce a similar motor reaction to that which results from impressions made on the other parts supplied by the same nerve.

We know that the motor reaction of any part supplied by the fifth is generally, and, as it were, by preference, made upon the facial nerve in the first instance, occasioning some required muscular movement over which that nerve presides; whereas, the motor reaction excited by impressions on the glosso-pharyngeal more especially affects the tongue, soft palate, and fauces, whilst that occasioned by impressions on the vagus affects some or all of the respiratory muscles. There would be much difficulty in attempting to define the exact mode in which the state of the impressional nerves of the internal ear influences different motor nerves in precise accordance with the requirements; but that it does so is as probable as that the impressional nerves of the interior of the eye react upon the motor nerves of the eyelids is certain. In ourselves, every one is aware of the extent to which the modulation of voice depends upon hearing; and although volition may here exert the greatest share of influence over the muscular acts required for correct intonation, it is not certain that a part of the result may not be due to the automatic reaction of the impressional nerves of the ear-sac. If this be so, what is commonly termed "a good ear for music," which confers on its possessor so remarkable an aptitude for combining the vocal muscles in harmonious concert, may depend in some measure on the sensitiveness of these auxiliary nerves rather than on any superior conformation of the organ essential to hearing. Whatever plausibility be accorded to this speculation, it is at least worthy of remark that the internal ear does receive filaments from the sensational portions of the fifth, glosso-pharyngeal, and vagus, in all vertebrata, and that this supply is greatest precisely in those animals in which the connection between the automatic movements governed by the main nerves, and those required for the purpose of modifying hearing, is most necessary and apparent. In the fish, for example, as the animal descends into deeper and denser water, the impression made on the lining membrane of the swimming bladder by the contained air under the compression it sustains from the greater pressure from without, excites through the vagus such motor reaction on muscles which can affect the swimming bladder as to cause greater compression still. In this way the densification of the contained air is further promoted, and the specific gravity of the animal correspondingly increased. It is very intelligible that, provided such motor reaction upon the swimming bladder could in any way modify sound, it might be very convenient to invest the ear-sac with the power of inducing it when required.

The compression of the tympanic membranes effected in mammals by the air admitted through the Eustachian tube, has its analogy in fishes in the mode in which the intra-cranial vestibular sac is compressed by the air contained in the swimming bladder. In the lowest depths of the ocean the density of the medium being very great, sounds must be intense, but all the sounds there existing will consist in those acute ones occasioned by the movements of fishes. By increased tension of its ear-sac, the fish is at the same time well adapted for hearing accurately acute sounds, and well defended from the excessive vibrations which any unusual noise might cause. Near the surface of the water, the diminished density of the medium lessens the need for defence against noise, whilst the occurrence of a greater variety of sounds demands the power of altering tension of the ear as may be required. As the fish rises, the compression of the ear-sac, and consequently its tension, are lessened, but may at any instant be increased by muscular action. For the purpose of suddenly defending the organ from undue noise at any depth, the voluntary compression of the ear-sac by the muscles which cover it, or affect it more or less immediately, may induce for the time increased tension of the ear-sac and obtunded sensibility.

In the cartilaginous fishes with fixed gills, we find a rudiment of middle and outer ear; a rise in the scale of development with which the inclosure of the internal ear in the walls of the skull in these fishes corresponds. In the skates, Breschet describes at length two tortuous ascending canals which open by almost imperceptible foramina at the back of the head. They are filled with concrete calcareous granules (*otoconies*), forming a mortar-like mass, and terminate internally by an oval foramen, with its proper membrane closing up the vestibule. A small muscle is so related to this oval membrane and to the tortuous ascending canal, as to compress the latter and tighten the former. Here we see the earliest type of a *tensor tympani*, but no otic ganglion is required to associate its action with increased secretion, because, by a still simpler arrangement, the muscle squeezes and so densifies the conducting medium (*i. e.* the calcareous matter in the tube), at the same time that it braces the oval membrane, and thereby lessens its vibratibility.

The mode in which the swimming-bladder is connected with the intra-cranial ear-sac, so as to impart to the auditory nerve the vibrations excited in its own contents, and at the same time mechanically to tighten or relax the acoustic membranes in proportion to its own compressed or relaxed condition, varies greatly in different fishes. In the carp tribe, the cranial end of the swimming-bladder is joined to three bones on each side, which play on the higher spinal vertebræ, and, through a tubular apparatus imbedded in the basilar bone, and filled with fluid, act indirectly on the ear-sac. In other fishes, the swimming-bladder sends up cœcal prolongations which apply themselves directly to the ear-sac, either with previous enlargement into globular cavities (as in the alose and the herring), or without this (as in *sparus salpa* and *sargo*.)

When a "*ductus pneumaticus*" opens from the swimming-bladder into the œsophagus, the aperture is not closed by a mere valve, but is encircled by muscle. When the sac is devoid of any external duct, and enclosed in a bony capsule (as in *Cobitis fossilis*), a distinct muscle exists by which the swimming bladder may be drawn closer to the surface, and thus compressed. "In some species of Gadus, muscular fibres extend from the vertebral column upon the air-bladder" (Owen). And, possibly, in the great majority of fishes, which possess the bladder but not the duct, the voluntary contraction of the external muscles is imparted to the swimming bladder. Hence the degree of tension of the bladder appears to be in some degree under the control of the will of the fish.

In fishes which have the power of producing sounds (*Trigla*, *Pogonias*), the swimming bladder and its duct are the parts subservient to this purpose. It is interesting in reference to this to find that the great vocal nerve, the vagus, is the source of supply to the swimming bladder.

There is reason, therefore, to infer that the swimming-bladder in the fish fulfils some of the offices of lung, larynx, Eustachian tube, and tympanum; playing a similar part in the acoustic adjustment of the ear-sac directly which those several organs in mammalia do more indirectly; and so far as it is an organ of acoustic adjustment, being unusually developed to meet an unusual requirement arising from the habits of the fish, and to compensate for the absence of some of the more delicate parts of the adjusting mechanism.

In the sharks we find neither the swimming-bladder of osseous fishes, nor the peculiar arrangement of muscle and tube met with in the rays. The rapid alternation of depth, and consequently of density of water, require a finer mode of accommodating the ear than is needed by the slow-moving grovelling skate, whilst the free movement of its bulky body would be shackled if the shark possessed a large floating buoy in the shape of a swimming-bladder.* Each ear has its own little air-bladder. Between the membrane of the vestibule and the surface of the head there is a small tube full of air. It rests below on the membrane of the ear-sac, and is covered in above by the external tegument. The walls of the tube are cartilaginous, and therefore firm and elastic, and well fitted to effect uniform reaction of the contained air when this is unusually pressed from without. As the shark descends into deep water, the pressure on the surface of its body affects the air in the little auditory tube through the medium of the skin, which closes it in externally. This pressure applied to the contained air is made uniform and general by the elasticity of the cartilaginous walls of the tube, and is thereby communicated in the most effective manner to the membrane of the vestibule. In this way is the membrane of the ear-sac tightened in exact proportion to the depth of the fish in the water, and consequently to the density of the medium in which it lies.

The shark appears to be the nearest approach of the fish to the amphibious animal. And in the crocodile we meet with a somewhat analogous arrangement in the *meatus auditorius externus*, which is closed under water by its valves, but is patent on land. In the closed condition under water, the inclosed air will be subject to the same changes which it undergoes in the auditory tube of the shark, the auditory air-bladder of the loach, or the larger swimming-bladder of many fishes.

The otic ganglion does not exist in fishes. In the absence of a tympanum, with its membrane and its muscles, the absence of the ganglion merely indicates that there is a connection of some kind between the two; not, as Arnold would have it, that the connection is between the ganglion and the *tensor tympani* muscle.

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* Professor Owen.

In reptiles the ear presents great variety in its organization, from the simple condition of the tadpole to the elaborate mechanism of the crocodile. In every variety the means of accommodation to sound present a corresponding variation, but the same principle is observed in all—the principle of modifying the tension of the ear-sac in accordance with sound.

As reptiles are intermediate in the scale between fishes and birds, so does the type of the ear in the lower reptile approach to that of the fish; in the higher that of the bird. The adaptive mechanism shares this resemblance. In the highest reptile we find a tympanum, with its Eustachian tube and drum-membrane, its cochlear as well as vestibular fenestra, its columella with its cartilages, and two muscles—*tensor tympani* and *stapedius*. But we do not find any otic ganglion. The elasticity of the auditory cartilages, by maintaining the convexity outwards of the *membrana tympani*, appears, in the reptile as in the bird, to replace the effect of that increased secretion in the cavity of the tympanum which appears in mammalia, but which, by the large size and patency of the Eustachian tube, the smallness of the tympanum and of its internal drum-membranes in the reptile, would be rendered nugatory. There is consequently no necessity for an otic ganglion.

In birds, also, the free admission of air into the tympanum through the large and patulous Eustachian tubes would ensure (temperature excepted) a similarity in hygrometric state, and consequently in power of conducting sound between the outer and the inner ear. Nothing could be gained by an apparatus for inducing sudden change as to moisture on the surface of the tympanic mucous membrane, and therefore an otic ganglion would be useless. The adaptation is sufficiently effected in other ways.

Birds always communicate in high notes. Their ears are doubtless strung on a high pitch, and thereby naturally defended from intense noise. To this end, there is no delicately-suspended chain of bones which is chiefly useful in propagating the slower undulations of grave notes when the *membrana tympani* is comparatively relaxed, but in its stead, a long cyndrical bone connected by elastic cartilages with the *membrana tympani*, and applied by its stirrup-end to the fenestral membrane of the vestibule. The *membrana tympani* being convex externally, is constantly kept on the stretch by the elasticity of the cartilages which tie it to the columella, and is thus adapted for high notes. As the bird rises up into the loftier regions where the atmosphere is rarer, the pressure both within and without the tympanum is lessened; the ossicle-cartilages therefore expand, and by pushing out the membrane, render it still more convex and tense, and so adapt it to the only sounds the bird has there to listen to,—its own high notes. When on or near the ground, the bird requires its ear to be fitted for recognizing, to some extent, the graver sounds arising everywhere around. The greater density of the atmosphere, by exercising greater pressure, will slightly lessen the extending influence of the ossicle-cartilages upon the *membrana tympani*, which thus, by a slight diminution in its tension, is enabled to vibrate more readily in unison with low notes. On the surface of the earth, not only does the denser state of the atmosphere increase the intensity of sound, but noises of every variety, grave and acute, abound. For the exclusively high notes of the loftier regions, the ear is adapted by the tension of the *membrana tympani*, which increases in exact proportion as the atmospheric pressure is lessened, and is therefore accommodated precisely to the given elevation of the bird. The tension of the drum-membrane being thus in inverse ratio to atmospheric pressure, decreases in the lower regions, and adapts the ear to grave sounds.

It seems not improbable that birds and other animals which communicate with each other in notes of a certain pitch, have their ears more particularly fitted for the exact hearing of sounds of that pitch, whilst sounds of very different note are appreciated with less exactness, mere recognition of them being all-sufficient for the purposes of the animal. If so, the bird requires but a small adaptation of its ear for grave sounds, but a very exact adaptation for acute sounds. Accordingly, in the bird, the means for causing and constantly maintaining tension of the ear-membranes are clear and apparent, whilst those for slackening the membranes to harmonise with grave notes are comparatively trifling.

Besides the constant and mechanical adaptation of the ear which results from modified elasticity of the ossicle-cartilages, the *membrana tympani* possesses a tensor muscle, by which the organ is instantly adapted to any sudden changes of sound.

But is the tympanic muscle in birds a tensor? Wagner considers it a laxator. Arnold, as we have seen, founds upon such a view an argument in favour of the otic ganglion being an excito-motory centre. Breschet, writing in 1830, states that "the only muscle of the chain of ossicles in birds *is a tensor*. I have shown," says he, "to many persons the action of the muscle in question, which consists invariably in stretching the tympanic membrane." In 1836,* when describing the internal muscle of the malleus in the turkey, he states, "this muscle, when it contracts, *relaxes* the membrane, of which any one may easily assure himself by experiment." Professor Owen considers the muscle a tensor.

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* Memoire sur le Ganglion Otique, &c. p. 17. Paris, 1830. Recherches sur l'organe de l'audition chez les oiseaux, p. 24. 1836.

In the bird, the *membrana tympani* is convex outwardly; in man, convex inwardly. Were there no difference in other respects, the direction of the tympanic muscle and the degree of vertical position of the membrane being the same, the result of the muscle's contraction must be just opposite in the two animals. In each, to lessen the convexity is to lessen the tension of the membrane. In man, the muscle by drawing inwards the membrane which is already convex in that direction, increases its convexity, and thereby tightens it. In the bird, if the muscle merely drew inwards the membrane now convex outwardly, it would lessen its convexity and thereby slacken it. But it does not act by drawing directly inwards. In birds, the plane of direction of the *membrana tympani* is much more nearly horizontal than vertical. The muscle arises from the occipital bone behind the posterior part of the bony rim, in which the membrane is framed, and ends in a fine long tendon, which, when seen through the semitransparent membrane on holding up a prepared bird's ear to the light, appears to lie like a white thread upon the membrane. It is inserted into the cartilage which represents the *malleus*, and by an expansion of its tendinous fibres into the *membrana tympani* itself. The line of its action would be downwards and backwards. Now, from the superior position of the triangle of cartilages which severally represent the *malleus*, *incus*, and *os orbiculare*, any drawing downwards and backwards of the malleal cartilage depresses the dimple of the *membrana tympani* in a direction corresponding with its natural aspect, viz. downwards, backwards, and slightly outwards. In proportion as the membrane is depressed at its dimpled centre, will its convexity and its tension be increased. The muscle is therefore a tensor tympani.*

Both birds and reptiles have the Eustachian tube large and patent, permitting free ingress and egress to the air contained in the tympanum.

Inhabitants of the air and inhabitants of the water alone possess the privilege of being able greatly to change their altitude in the medium in which they live. As the fish descends into deeper water, its ear requires protection against the greater intensity of sounds conducted by the now denser medium. The object is gained by increasing the tension of the ear-sac, which in some is effected directly by the pressure on the air contained in the swimming-bladder increasing with the depth of the water. Nearer the surface, there may be, to a small extent, a variation in the pitch as well as in the intensity of the sounds conveyed by the water. The ear is accommodated to every variation by voluntary alteration of the state of the swimming-bladder. Birds, on the other hand, in their loftiest flights, require the ear to be strung high for the acute and faint notes which the rarefied atmosphere conducts; whilst, when on the ground, they need a less amount of tension, but a greater exercise of the power of varying it. Thus the fish and the bird alike have their ears naturally adapted for high rather than grave notes, and alike fitted for self-adjustment in every variation of medium. So far they agree. But the fish's ear is tighter in the denser strata, the bird's in the rarer strata. The reason is not obscure. The tightening action is the adapting action, and the ear requires adaptation most where sounds exist in greatest variety. The uncovered surface of the earth—man's habitation—is the field on which sounds vary most; and near the surface will the ear require the most frequent variation in its tension. The exercise of the adaptative mechanism of the ear is made by the fish to the greatest extent in the higher strata, by the bird in the lower strata, of their respective media.

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* Breschet was of opinion that a rudimentary stapedius muscle also existed in birds.

Man and terrestrial mammalia, communicating by, and exposed to, sounds of every variety of pitch, require more extensive and diversified means of adaptation for the ear. The membranes are probably strung with a medium amount of tension, fitted for the appreciation of sounds of medium pitch, but capable of being tightened to any extent in accordance with acute notes. We now find a narrow Eustachian tube, a chain of bones, an *otic ganglion*, and a distinct external ear-passage.

The cetaceous mammals inhabiting the water, form the link between amphibia and the higher mammifera. They possess a large Eustachian tube for transmitting aërial sounds, and a diminutive *meatus externus* for sonorous undulations originating under water, tympanic ossicles and muscles, but no otic ganglion.

We find, then, that the presence of an otic ganglion coincides with the existence of a tympanum, a tensor muscle, a narrow Eustachian tube, and a true *meatus auditorius externus*. Whenever these conditions co-exist, there we have the ganglion. A tympanum may exist without it, a tensor muscle may exist without it, a *meatus externus* may exist without it, and a Eustachian tube, but not a narrow one, may exist without it.

Fishes have no tympanum, and need, therefore, no otic ganglion. Reptiles possess tympanum, tympanic bones and muscle, and Eustachian tube; but the tube is so wide and patent, that no moistening of the tympanic walls could operate in modifying the conductibility of the air contained within them. So also of birds. Neither birds nor reptiles, therefore, possess an otic ganglion. They need not accuracy of adjustment to so great a variety of sounds, and do not require so careful a defence from sudden variation as higher animals do. Cetacea possess tympanum, ossicles, muscles, and *meatus externus*, but no otic ganglion, for the same reason that this is denied to reptiles and birds, viz. the large size and patency of the Eustachian tubes. In man and mammalia only do we find an otic ganglion, and in them only do we find the Eustachian tube so small as to allow the air within the tympanum to be readily confined there by muscular compression of the guttural mouth of the tube. This concurrence indicates the office which I assume to be fulfilled by the otic ganglion.

A body conducts sound well in proportion, first to its density, and secondly to its elasticity. Hence a moistened membrane or cord, being less elastic, vibrates less than a dry one. Every one knows the effect of wetting the parchment of a drum or a catgut string. In the higher animals, the moist wax of the outer ear-passage, in addition to its other uses, will absorb and stifle some of the sonorous waves. The moist mucous lining of the middle ear, and of the cells which communicate with it, will serve a similar purpose on the inner side of the tympanic membrane. We infer also that the oval membrane, to which the stapes is attached, and the free round membrane, may each have its vibratibility modified by the sudden secretion of mucus, in answer to extra-stimulation of the otic ganglion induced by intense noise.

We are all familiar with the clearness of distant sounds on a calm frosty day, when the air is dry and dense, and with their dulness on a warm foggy day, when the atmosphere is rarefied and damp. When the Eustachian tube becomes closed from disease, the air contained in the tympanum is expanded by the heat of the body, and thus rendered a worse conductor of sound; it distends the middle ear, stretches out the *membrana tympani*, and deranges the delicate connections of the tympanic ossicles. Deafness results, and may be removed for a time by admitting fresh air, either by rendering the natural passage pervious, or by making an artificial opening through the *membrana tympani*. We assume, therefore, that the Eustachian tube has a twofold use;—to prevent deafness, by allowing of change of the contained air; to cause deafness more or less complete at will, by admitting a larger quantity of air into the tympanum and confining it there.

Savart and others have corrected the ancient opinion that hearing is rendered more exact the more the *membrana tympani* is tightened. This is only true as regards acute notes; for loud deep notes, as well as very faint sounds, will affect most easily, and to the greatest extent, a dry loose membrane, just as a dry loose sail will flap more before the wind than a tight wet one. It is generally admitted that the *membrana tympani* is tightened for the fulfilment of one of two purposes,—to adapt itself to the rapid vibrations of acute sounds, or to shut out and oppose the full vibrations of over-loud noise.

When a man desires to distinguish the faintest sound, we observe the following steps of preparation. The breath is held, that no suction through the Eustachian tube may affect the air in the middle ear, and no respiratory sound confuse the sense of hearing; the ear is directed towards the presumed source of the sound; the jaw is dropped, partly to take off the pressure of its condyle upon the cartilaginous portion of the *meatus externus*, and thus allow a free admission to the sonorous waves, partly to permit of gentle breathing when the attention is prolonged, since the effort of respiring is greater when the mouth is closed. In brief, the passages are kept open, the air in the tympanum is unconfined, and the membranes are left as slack as possible; the roused attention quickens the sensorium; and thus are distinguished sounds so slight, that, under ordinary circumstances, they would pass unnoticed.

So far, there is little that is active in listening; but when we desire to listen to acute notes, we excite the tensor muscles to the requisite extent by an act of the will. Intent listening is always an act of the will. And to obviate the disagreeableness of short and sudden noise for which we are prepared beforehand, the voluntary action of the tympanic muscles may be all that is necessary; but when loud sounds are prolonged, the automatic acts of defence come into play.

To prepare the ear for a sound of injurious intensity, we draw in the breath, close the mouth, and compress the cheeks, avoiding at the same time exposure of the ear to the presumed direction of the sound. By the firm closure of the jaws, the *meatus ext[illegible]us* is compressed, and its capacity slightly lessened. By filling the respiratory passages with air and then compressing the cheeks, an increased quantity is propelled into the tympanum. By closure of the canal of the Eustachian tube near its guttural extremity, the air admitted is denied an exit from the tympanum. Rarefied by the heat, it expands and presses against the *membrana tympani* with greater force than usual. The tensor muscle, by drawing the membrane inwards against the contained air, tightens it still more, whilst the *stapedius* presses the stapes firmly against the oval membrane. The chain of bones and their drum-membranes being thus braced and held firm, are less forcibly affected by intense sound,—at the same time that, by its rarefaction and by the increased exhalation of the moisture poured out on the mucous walls, the air has lost much of its conducting power.

Whatever may be the office of the membrane which closes in the *fenestra rotunda* under ordinary circumstances,—whether it be merely to first yield to, and then react on, vibrations which have already gone the round of the cochlea, having entered through the vestibule, or whether it serve to conduct to the cochlea vibrations conveyed through the air of the tympanum,—its condition as to vibratibility must exert considerable influence upon distinctness of hearing. Hence the sudden damping of this drum-head will lessen the delicacy of the sense. Such a conjecture appears to derive support from the fact that, in the true amphibia, the *fenestra cochlearis* has no existence. In the frog, for example, obliged by the absence of ribs to swallow air, and then to propel it from the fauces into the lungs, bearing in mind the large wide and short Eustachian tube,—a free and exposed inner drum-membrane, such as the *membrana rotunda*, must always be—would have been subjected to the drying and sucking influence of this peculiar mode of respiring. The frog, therefore, has no *fenestra rotunda.* It is true that animal has no complete cochlea; but that alone would not suffice as a reason for the absence of the *fenestra rotunda*, since in the turtle there is no cochlea, whilst there is a *fenestra rotunda.*

I have assumed, that both *tensor tympani* and *stapedius* are voluntary muscles,* capable, like all others, of acting automatically in response to the spinal chord. Their analogy is not with the iris, but with the external muscles of the eyeball. As the voluntary nerves of the tensor muscles have no connection with ganglia, the effect will be that, when we desire to listen to high notes attentively, the tensor muscles are called into action without any excitement of the nerves which govern secretion, and thus the result is not lessened by any extra-moistening of the tympanic cavity; but when prolonged and intense noise requires every defensive means to be called forth, the involuntary spinal nerves excite, without our consciousness, the action of the nerves of secretion, causing mucus to be freely poured out on the lining membrane of the middle ear, damping the drum-membranes, and moistening the confined and rarefied air.

No mention has yet been made of a *laxator tympani*, because the existence of such a muscle is debated by anatomists.

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* Mr Pilcher considers them as capable of both voluntary and involuntary action; and he refers the latter power to their possession of ganglionic connections.—On the Ear. London.

If it exist, it probably derives its nerves from the *corda tympani*,[*] and may come under the same category with the preceding.

Considering the ear in its highest form as consisting of an inflection of the outer tegument, of an inflection of the mucous membrane or internal tegument, and of a nerve-sac, we find that each division has its appropriate supply of nerves.

The *meatus externus* in common with the skin in its neighbourhood, and with the outwork of the eye, nose, and mouth, receives its impressional and organic nerves from the fifth. In the deeper portion, however, of the meatus, near to the *membrana tympani*, where the ceruminous glands lie thickly imbedded, organic filaments are met with from the sympathetic, vagus, and otic ganglion, by means of which the secretion even of ear-wax is connected with the state of the system generally, of the stomach, and of the middle ear. We may hence with some probability infer, from the state as to secretion of the outer ear, what that of the tympanum may be. If the meatus is dry, with mere scaly chips of cerumen, there is probably a corresponding defect of secretion on the internal side of the *membrana tympani.*

The middle ear is rich in nerves. We cannot submit them to experimental investigation, nor are the effects of disease sufficiently open to observation to clear up the question of their function; yet there must be something significant in the constant supply of contributions from so many different nerves. There is meaning in the intricacy; and if any clue to this meaning be afforded by the theory already laid down, its applicability will in turn tend to substantiate the theory.

The tympanum being continuous with the mouth, larynx, and fauces, requires its state, as to secretion, to be kept in harmony with that of the general tract of mucous membrane. Being connected in office with the outer and the inner ear, it must harmonize with these; and being associated with the action of its own muscles, the mucous lining needs some medium of connection with them.

Entering into the tympanic plexus, we find filaments from the vagus, glosso-pharyngeal, fifth and sympathetic nerves, and from the otic ganglion. These filaments are probably all either impressional or organic. In all vertebrate animals, a communication by anastomosis takes place between the fifth and the eighth nerves. The tympanic plexus is this communication highly developed; but that it does not exist merely for the purpose of connection is proved by the interesting fact remarked by Breschet,[†] that the nerve-tract is slenderer in the centre, where it gives off filaments, than at either extremity. The tympanic plexus distributes filaments to the lining membrane of the tympanum, to the tympanic extremity of the Eustachian tube, and to the inner drum-membranes. It sends none to the muscles, nor through the *fenestræ* into the internal ear.

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[*] Longet, op. cit.

[†] De l'Ouie, p. 259.

By means of the vagus, the state of secretion in the tympanum is connected with the larynx, lungs, and stomach. By means of the glosso-pharyngeal, with the base of the tongue, fauces, and soft palate. By means of the fifth, with nostrils, mouth, and pharynx. By means of the otic ganglion, with motor excitement of various nerves, as well as with impressions made on its own surface, and perhaps with those made on the non-special nerves of the labyrinth. By means of the sympathetic, with the condition of the system at large.

Whence arises the necessity for such extensive harmonization of the mucous membrane of the tympanic cavity with other parts? We have seen that the middle ear is the part in which the adaptation of the organ has chiefly to be effected, and that variation in its secretion in all probability materially affects the conduction of sound. Now the adaptation of the ear is required on three different accounts, each of which exercises a special influence on the adapting agency. It is required, firstly, to attune the ear to catch with the greatest accuracy sounds from without; secondly, to catch with instant exactness sounds from within,—the sounds of the individual's own voice; thirdly, to shut out as much as possible obnoxious noise.

A correct appreciation of sound is essential to harmonious vocalization. In ordinary speaking, and still more in impassioned eloquence, the mind dictates the word, but the ear directs the note. The respiratory and other muscular movements on which articulation depends are guided by the ear. The rapid change of emphasis and intonation from loud vehemence to soft and gentle utterance, demands as quick a change in the action of the machinery of the ear. We are not conscious that we produce this change in the ear voluntarily; and probably we do not. We will to give the sound experience has taught, and we guide the sound correctly by the ear; but we pay no attention to the ear at the time. The attempt even to do so seems rather to interfere with the perfection of the action. In difficult passages of vocal music, in playing wind instruments, or in whistling a tune, the person whose ear without his notice guides him succeeds the best. For this precise and automatic relation in action, we should expect some especial provision in structure; and such we find. Lined by a process of the same membrane, supplied by the same nerves, and exposed in the same way to the air, the tympanum, tongue, larynx, and lungs are intimately connected in structure.

Bearing in mind the distinctness in tone, pitch, and strength of the elementary vocal sounds—that each depends for its production upon a given state of muscular contraction in some one, or in several of the parts concerned in articulate speech,—that the muscular act is superintended by impressions made on the mucous surface by the breath, or by contact against related parts, and that the part impressed, and the muscles excited, are perpetually changing with the rapidity of thought in every effort of speech,—that with every such change there is a corresponding change of sound,—we see a reason for giving to the ear filaments from each of the impressional nerves which supply the various parts on which impressions are made in voice and speech. The laryngeal vowels make one impression, and excite one especial series of muscular acts; cause one kind of sound, and require one given condition of the ear. The labial, dental, lingual, and guttural consonants differ in the part impressed, the particular reaction on muscles, the nature of the sound, and in the nature of the acoustic adaptation required.

Seeing that the adaptation of the ear consists in modified secretion,* and in modified muscular action, both of which result from impressional reactions,—the one in ganglia, the other in the spinal chord,—we have a right to infer that a dental, or labial, or lingual sound reacts through the fifth nerve on the ear in such a way as best to fit the ear for the reception of that particular sound; a palatal sound through the glosso-pharyngeal, and a laryngeal sound through the vagus in similar way.

By impressional reaction, the impression made on the filaments of the vagus in the larynx by the passage of the breath, affects at their origin those filaments of the vagus which supply the ear, and by excentric action through these filaments, excites the ganglionic cells through which they pass, inducing modified secretion.

By motor reaction, the laryngeal filaments of the vagus excite the movements required for continuance of voice; the acoustic filaments of the vagus those for adaptation of the ear.

Reversing the order. When sudden and unexpected sound sets to work the adaptive mechanism of the ear, the altered impressions now first made in the organ of hearing may react on the origin of the laryngeal and other filaments of the vagus, inducing their peculiar impressional and motor reactions, which in turn become subservient to the conservation of the ear.

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* So also of the larynx, since "the experiments of Savart have shown that a cavity which only responds to a shrill note, when its walls are firm and dry, may be made to afford a great variety of lower tones, when its walls are moistened and relaxed in various degrees."—Carpenter's Human Physiology. Ch. on the Voice and Speech.

The general law may be thus stated:—When two distinct parts derive filaments from the same impressional nerve, there is a concordance in the impressibility of the two parts. The result of this is, that an impression on one will not only excite its peculiar reactions on that part itself, but also on the other part at the same time; an alliance in action necessary to perfect relation in function.

The tympanic filaments of the fifth, glosso-pharyngeal, and vagus not only serve to connect the impressibility of the middle ear with that of distant though allied parts, but they do the same in reference to the internal ear and to the acoustic ganglia, all of which receive contributions from the same nerves. Whatever be the precise offices subserved by these impressional nerves in the inner ear, there can be no doubt that any excitement commencing there would extend its influence (by impressional reaction) to the tympanic filaments of the same nerves, and to all others functionally concerned. We may enumerate, therefore, the following uses for the filaments furnished by so many sources to the tympanic plexus: (1.) To supply impressional and organic nerves. (2.) To connect impressions made in the tympanum with impressions made in other allied and distant parts supplied by the same nerves, and *vice versâ*. (3.) To invest the tympanum with the power of calling forth the special motor reaction, or the ganglionic reaction of any one, or of all of these several nerves. (4.) And as contributions from the same impressional nerves which supply the tympanum proceed to the acoustic ganglia and to the internal ear, to connect together the impressional and organic actions of the middle and inner ear.

With respect to the muscular branches of the otic ganglion, anatomists are as little decided as formerly they were concerning the very existence of the ganglion itself. Arnold appears to signalize the internal pterygoid as possessing the greatest connection with the otic ganglion; whilst Breschet describes and figures the buccal nerve as receiving a much larger contribution. From dissecting a number of animals, I may state that the otic ganglion sends filaments to each of the branches which proceed from the *portio minor* of the fifth to the muscles of mastication. The origin of these filaments is of course conjectural. I surmise that they belong originally to the *portio minor*, and merely pass through the otic ganglion in order to associate this with the muscles they afterwards supply. The contribution from the ganglion to the buccal nerve manifestly consists largely of grey filaments. What is their destination? As the buccal nerve comes into close proximity to the parotid gland, where it gives off its twigs to the temporal muscle, the organic nerves might have their termination here; but this is in itself improbable, and is rendered still more so by the fact that birds have largely-developed salivary glands without any otic ganglion. There does not at first appear to be any special reason why a direct connection as to the state of secretion should subsist between the mucous membrane of the tympanum and that of the cheek; yet, in ordinary speaking, such an association may be constantly needed. The gentle stimulus imparted to the otic ganglion by the consentaneous action of the spinal filaments of the masticatory nerves which pass through it, when the volitional filaments are exercising their influence on the muscles of the cheek and jaw during speech, may be precisely such as to maintain that lubricated condition of the tympanum, Eustachian tube, and cheeks, which best adapts them for correct appreciation of the voice, and the buccal cavity for its smooth transmission and modulation.

The necessity of closely connecting increased secretive action of the entire upper tract of mucous membrane, in all its ramifications, with the muscular movements of voice, is obvious from the drying effect which the rapid passage of the breath would otherwise produce. In consequence of every impressional nerve of this extensive mucous surface sending filaments of contribution to the various ganglia, impression and increased secretion proceed *pari passu* in every part at once; and this result is still further promoted by the motor nerves of such neighbouring muscles as move automatically in speech also sending filaments to the sympathetic mucous ganglia.

The *tensor tympani* has two distinct motor nerves. Besides the gangliated nerve, which it receives from the otic ganglion, it has a second from the internal pterygoid nerve, which is not in any way connected with the ganglion. In this respect it precisely resembles the *tensor palati*, which receives one nerve from the otic ganglion, and another from the main trunk of the pterygoid. In both muscles the same purpose is answered. The voluntary action of the *tensor tympani*, by which the ear is fitted for attention to acute sounds, is effected through the medium of the non-gangliated nerve, without any excitement of the otic ganglion accompanying it, which, indeed, by moistening the tympanic membranes, would have just defeated the end. So, also, when the *velum palati* is required to be voluntarily tightened, it can be so through the non-gangliated nerve of the *tensor palati*, without any interference with the secretion in the tympanum. But when these muscles contract automatically in response to excitement of the special and common impressional nerves of the ear, the action is a defensive one, and the association of the influence of the otic ganglion becomes essential.

The clenched jaw shows the excited action of the muscles of mastication, with which the otic ganglion through its connection with the motor nerves directly sympathizes. At the same instant the *velum palati* is raised by its azygos and levator muscles,—through branches from the facial and glosso-pharyngeal nerve, both of which are gangliated and consequently involuntary,*—and is rendered a fixed point by their conjoined action; the remaining muscle, the *tensor palati*, is excited through the nerve which passes to it from the otic ganglion, which is thus still further drawn into co-operation. By the action of the *tensor palati*, the velum is stretched, whilst the trumpet-shaped mouth of the Eustachian tube is lowered. The narrow canal of the tube is thus compressed; and the air within the tympanum, previously pushed in by a squeezing movement of the mouth and pharynx, is confined, and denied escape through its ordinary outlet. The warmth of the cavity rarefies the air, which, by its expansion, becomes a worse sound-conductor, at the same time that it assists in tightening, by its pressure from within, the *membrana tympani.*

Pressed outwards by the expanding air, the *membrana tympani* is drawn inwards by its special muscle, through the involuntary nerve which this receives from the otic ganglion. Thus tightened to its utmost, the outer drum-membrane will scarcely vibrate; whilst the inner ones, moistened in common with the rest of the tympanic cavity by the extra-secretion which the otic ganglion causes to be poured out, deaden as much as possible the sound that enters. The otic ganglion is itself excited on every side, not only by the impressional filaments which it transmits, but secondarily by each of the motor filaments which these impressional nerves have roused to action passing through it.

In this view we find an explanation of the double supply of the *tensor tympani*, *tensor palati*, and muscles of mastication, with motor nerves not connected with the otic ganglion, and with motor filaments which traverse that ganglion; and likewise of the difference in the source of the motor nerves supplied to the *velum palati;* the azygos and levator muscles deriving their nerves from the facial and glosso-pharyngeal, the circumflexus or tensor from the motor division of the fifth;—the first two muscles acting in concert to fix the velum; the last acting singly when the velum is fixed; the first two being more closely associated in their ordinary action with the muscles of the cheeks and nostrils, which are supplied by the facial nerve; the last with the muscles of mastication, which are supplied by the fifth.

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* Which arrives through the Vidian and Meckel's ganglion.—See p. 24.

Is the excitation of the adaptive machinery of the ear an attribute of the special nerve of hearing only, of the common impressional nerves only, or of both? Referring to the eye, we find that the internal mechanism responds chiefly to the special nerve, the external to the common nerve. The iris responds to the optic; the closure of the lids to the fifth nerve. So of the ear; the secret mechanism of the internal ear may chiefly respond to the excitement of the acoustic nerve; but the muscular and organic changes of the middle and outer ear are excited and governed by impressional nerves of the ordinary kind. Just as the retina appreciates the luminousness of light, whilst the fifth takes note of its calorific and chemical properties, so the *portio mollis* may distinguish the sound, whilst the impressional filaments observe the force of sonorous waves. The relative distance of objects is recognised by a combination of sensation and muscular movement; the relative directions of sounds are ascertained by a combination of the sensation in a given part of the internal ear with the muscular movement necessary for best receiving sound from the given point. Hence the use of the impressional filaments supplied to the internal ear.

But in what does the adaptation of the internal ear consist? Seeing that in the lower vertebrata it consists in altered tension of the nerve-sac, we inquire how such a result could be produced in man, conformably with anatomical arrangements. The ear-sac may have its tension modified in four ways. (1.) By pressure from without, through the medium of the inner drum-membranes. (2.) By muscular contraction of some part of the walls of the nerve-sac itself. (3.) By altered degrees of fulness of the vascular tissue connected with the nerve-sac. (4.) By altered quantities of the eudo-lymph or exo-lymph secreted in different compartments of the internal ear.

We have no proof that any of the last three actions take place. Nor, apart from the absence of proof, have we any reason for denying them.

If there be muscular tissue in any part of the nerve-sac, that will be the analogue to the iris; if there be erectile action in the highly-vascular membrane of the cochlea,* that structure will be the analogue to the ciliary process and base of the iris; of the two, the *ganglion acusticum*, rather than the *G. oticum*, is the analogue to the ciliary ganglion; but both the auditory ganglia conjoined really form the analogue to the ciliary.

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* The conjecture that erectility, or at least vascular turgescence, may find its place in the means of adaptation for the ear, derives support from the structure observed in the ear of the porpoise by Breschet. The tympanum is completely filled by a *rete vasculosum*, which dips down from the large cavernous sinus. In place of a Eustachian tube, there is but a rudimentary chink. In the porpoise, therefore, the fenestræ of the internal ear and the tympanic ossicles, instead of being surrounded by atmospheric air, are bathed in venous blood, the lining membrane alone intervening. When the animal gambols on the surface of the water,

There may be even a focal adjustment in the internal ear, by means of which sonorous waves are brought to produce their greatest influence on certain points, such as the cochlea for slow grave notes, and the ampullæ of the semicircular canals for acute rapid sounds. The greater distribution of nerves to these points favours such a conjecture.

On the mere assumption that there is some organic alteration in the ear-sac for its adaptation to sound, how interesting it becomes to find filaments from the same nerves which we have already seen concerned in the accommodation of the middle ear, traceable so far, that their extension to the internal ear is extremely probable! Connected with the little *ganglion acusticum*, the various filaments from fifth, glosso-pharyngeal, vagus, and facial, associate, in unity of action, the labyrinth and its outworks.

The only recorded experiments which can be made to bear on the office of the *ganglion acusticum* are those of Flourens.* The narrator himself has deduced inferences which appear to me unwarranted by the premises;† but the experiments he details are interesting and important, especially in reference to the automatic movements connected with hearing, and by analogy to those of the system generally. The following are some of the facts.

(1.) Section of any of the semicircular canals, either in birds or mammals, causes acute pain.

(2.) It causes a special and particular movement, which is always the same for the same semicircular canal, and different for a different canal.

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respiring easily, the circulation will be free, and no vascular distension arise; but when the animal descends into deep water, as it does not possess gills for the aquatic aëration of its blood, its circulation becomes impeded, and its various sinuses congested. As the *tympanic rete* is distended along with the rest, pressure is exercised on both internal and external drum-membranes, and increased tension of the auditory apparatus results, and effects the adaptation of the ear to the increased density of the water. It may be that the animal possesses indirectly a voluntary power also over the degree of fulness of the venous sinuses about the head by muscular contraction or otherwise. If so, the tension of the ear may undergo alteration at will. There is a manifest analogy to the erectile structures of the eye in different animals, viz. the ciliary processes of mammalia, the pecten of birds, and the choroid body of cartilaginous fishes.

* Recherches Expérimentales, 1842. 2d edition, p. 438 *et seq.*

† Such, for example, as that the cochlea is the "only indispensable part of the ear," the "true seat of the sense of hearing;" a set-off to Vicq-d'Azyr's opinion, that the cochlea is "not indispensably necessary to the functions of the internal ear."—Œuvres de Vicq-d'Azyr, T. iv. Paris, 1805.

(3.) Section of the anterior vertical canal causes a movement of the head forwards, or a somerset of the body forwards; section of the posterior vertical canal, movement of the head backwards, or a somerset of the body backwards; section of the external horizontal canal, movement outwards from side to side, or rotation on the side.

(4.) When the corresponding canals on both sides are divided together, the effect is much more remarkable, the movements more violent, and attended with convulsive motions of the eyelids and pupils.

(5.) After recovery from the immediate effects of the operation, the movements cease during repose, but recur when the animal voluntarily moves, increasing in proportion as the animal desires to move actively.

(6.) When the horizontal canals on both sides were divided at the same time, the animal whilst standing still could maintain its equilibrium, but the horizontal movement of the head was always rendered more considerable by any movement of the body. The bird could neither run nor fly. " On being thrown up into the air, after some incoherent movements of its legs and wings, the whole body stiffened and fell down as an inert mass."

(7.) Injury to the bony boundary of one of the canals produces no effect; injury of the membranous canals is necessary to produce the result.

Besides the more obvious conclusions from these experiments, Flourens deduces some singular ones. He considers the cerebellum as the centre of three sets of fibres,—transverse, superior, and inferior. Section of any one set of these fibres produces the same movement as section of the corresponding semicircular canal. Thus, section of the *pons varolii*, which contains the transverse fibres, and section of the horizontal canal, alike occasion horizontal movement of the head, or rotation of the animal on its side. Section of the *processus é cerebello ad testes* (superior or postero-anterior fibres), and section of the superior vertical canal, alike occasion vertical movements forward. Section of the *corpora restiformia* (posterior or antero-posterior fibres), and section of the posterior vertical canal, alike occasion vertical movement backward.

In accordance with his previous conclusion, that the cochlear nerve alone is the true nerve of hearing, Flourens divides the *portio mollis* into the cochlear nerve and the nerve of the semicircular canals. The latter he views as a special and proper nerve, constituting with its fellow on the opposite side, a new pair to be added to the list of cranial nerves. " It is not," says he, "a nerve of sense at all, but is endowed with the singular faculty of influencing the direction of movements." The nerve is stated to derive its origin from each of the three sets of cerebellic fibres above-mentioned, which are classed together as the "fibres opposées" of the encephalon. The nervous system is described as exercising a threefold influence over the muscular; it excites, regulates, and moderates movement. The exciting influence is due to the spinal chord, oblong medulla, and the nerves. The regulating influence to the cerebellum. The moderating influence resides "at once both in the semicircular canals of the ear, and in the 'fibres opposées' of the encephalon." Consequently, the movements manifested after injury of the canals or the cerebellic fibres are to be ascribed, not to excitement of particular fibres, but to removal of moderator forces which normally prevent the given movements from taking place.

Without assenting to, or discussing, these opinions, I proceed to deduce from the premises a few inferences which appear to me less questionable.

(1.) The internal ear possesses certain excitor nerves; and these appear to be chiefly distributed to those advance-guards of sound, the semicircular canals. These excitor nerves produce a special motor reaction according to the particular canal in which the excitement originates. The motor reaction is precisely such as best adapts the ear for catching the sound which stimulates it; the ear being thrown backwards to catch a sound from behind, forwards to catch a sound from before.

(2.) This, rather than actual hearing, seems to be one function of the canals; another being probably the equable conduction and concentration of sonorous vibrations to the ampullæ in the vestibule.

(3.) Since pain is one of the phenomena induced, these excitor nerves are probably of the ordinary kind of mixed impressional nerves.

(4.) The motor phenomena of dividing the semicular canals are due to irritation set up artificially in the excitor nerves, and not, as Flourens considers, to *removal* of any restraining influence which he assumes the canals to possess over muscular movements.

(5.) Although the movements which result are definite and automatic, and therefore involuntary, still they are found to be greatly, though indirectly, influenced by volition. They are especially influenced by any considerable excitement of the general motor centre;—an additional proof that the volitional and non-volitional motor centres are structurally related in some way.

(6.) We may infer from the specific movement occasioned by exciting a specific part of the internal ear, that we ascertain the direction of sound by a mental combination of the relative situation of the spot in the internal ear first impressed, with the given muscular movement required for exposing the organ to the sound; just as in the eye we judge of the size, distance, and direction of objects, by combining the point of retina impressed, with the muscular movement required for distinct vision.*

Flourens found that irritation of the impressional nerves of the semicircular canals rendered hearing for the time more acute. In the eye, we found reason to conclude that irritation of its impressional nerves (filaments of the fifth) could either quicken or impair vision by inducing their ganglionic reaction on the vascular structures. By analogy we infer the same of the internal ear.

The normal stimulus of the impressional nerves of the eye is light—as a chemical and calorific agent, not as light. The normal stimulus of the impressional nerves of the internal ear may be sound—as motion of material particles, not as sound. The same end would be fulfilled in both cases. When the nervous expansion of the special sense is in danger of sustaining injury from over-stimulation, the common impressional nerves are likewise excited, and their particular reactions called forth. By their motor reactions, they induce conservative muscular movements without. By their ganglionic reactions, they occasion some beneficial modification of the capillary circulation within the organ itself.

Anatomy, both human and comparative, experimental physiology, and analogy, thus each furnish their quota of evidence to support the opinion that the internal ear has its special nerve for audition, its common impressional nerves, its motor, and its ganglionic grey nerves. And if the reader refuse to admit the opinions sketched out above, because they are not, nor can they ever be demonstrated, he will at least allow that the several diversified facts adduced require an explanation of some kind.

Division of the fifth nerve is not so fertile in its results concerning the ear as it is with respect to the eye. It is said to cause deafness; but the proof is difficult in an animal stunned and bewildered with agonizing pain.

The fifth nerve endows the *meatus externus* and the tympanum with much of their common sensibility, but furnishes only a small contribution to the labyrinth, and that probably is distributed to parts not essentially concerned in the act of mere hearing. The ear, therefore, usually performs its functions well in palsy of the fifth, unless in that variety of anæsthesia which excites irritation in the parts to which the palsied nerve is distributed. In one case of anæsthesia of the fifth nerve, there is deafness; in another, hearing is almost or quite perfect. The deafness, when present, may be owing to disorder of organic action in the ear, induced by the irritated filaments of the fifth deranging the ganglia of the internal and middle ear; but far more frequently it depends on extension of some structural disease, which has palsied the fifth, to the seventh nerve, or to the tissues of the labyrinth itself. Hence, the co-existence of deafness with loss of power in the fifth is a grave complication, inasmuch as it ordinarily indicates a structural lesion as a cause for the anæsthesia. It becomes still more significant if facial palsy be superadded, from the *portio dura* becoming implicated in the disease.

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* See Medical Gazette, 1842, p. 743; where I have endeavoured to demonstrate this point by the phenomena of shadows after the operation for strabismus.

In the distribution of branches from so many different nerves to the tympanum and labyrinth, we see a direct mode by which morbid sympathies between the ear and other parts are set up. The occurrence of otalgia with derangement of hearing from the irritation of a carious tooth, is due to the instrumentality of the fifth nerve; from gastric or other disorder of the abdominal viscera, to that of the vagus; from pharyngitis, to that of the glosso-pharyngeal, in addition usually to actual extension of morbid action along the Eustachian tube. The induced disorder may be merely one of sensation, in which case "*sublatâ causâ tollitur effectus;*" or, owing to the sensational having greatly deranged the ganglionic nerves, disorder of secretion or nutrition may ensue, and lead to more serious lesion, which will not necessarily subside with the removal of its exciting cause. From its exposure, its connections, and its free supply of nerves, the middle ear is the portion of the organ which generally and chiefly suffers; but there may be cases of so-called nervous deafness, in which the loss of hearing in the first instance was caused by sympathetic irritation of the impressional nerves of the labyrinth disordering the nutritive actions going on in the internal ear, in a similar manner to that in which sympathetic amaurosis is occasioned.

To recapitulate the somewhat complicated distribution of the gangliated nerves of the ear:—all parts of the ear derive impressional filaments from the fifth, glosso-pharyngeal, and vagal nerves, and may, and probably do, receive grey fibres from the spinal ganglia of these several nerves at the same time. All likewise receive more or less directly ganglionic filaments from the superior cervical ganglion.

Of the external ear, the pinna and the outer portion of the *meatus externus* are supplied by the fifth exclusively; whilst the inner portion of the *meatus*, where the ceruminous glands lie thickly imbedded, receives filaments from the glosso-pharyngeal and vagus, from the otic ganglion and from the fifth. The middle ear receives filaments from the fifth, gloss-pharyngeal, and vagus, and from the otic ganglion. The internal ear receives, in like manner, filaments from each of these three nerves, and grey fibres from the *ganglion acusticum.* By the grey ganglionic nerves being thus associated with the several impressional nerves, organic action is susceptible of modification in answer to excitement of any one of these nerves. By the otic ganglion, the organic actions of the middle ear are associated with contraction of the *tensor tympani*, and of other muscles. By the acoustic ganglion, the organic actions of the internal ear are associated with contraction of the *stapedius*, and possibly with some muscular contraction of the walls of the ear-sac within the labyrinth.

To obtain cumulative evidence of the truth of the general principles formerly laid down, it is desirable to ascertain, as we proceed, how far they are supported by facts connected with each particular ganglion and set of ganglia. From a survey of the ganglionic relations of the fifth nerve, we obtain the following confirmations of the general argument.

1. The organic actions of the parts supplied by the trigeminus are invariably associated with the impressibility of the same parts. Whether or not the subsidiary ganglia co-exist, the Gasserian ganglion is invariably present.

2. The Gasserian ganglion is quite competent to, and sufficient for, the superintendence of the organic actions going on in the organs of the special senses, as well as in all other parts supplied by the fifth nerve, so long as these several parts are not directly connected and associated with the action of special muscles. *e.g.* The fish possessing an eye, ear, and nostril, perfect of their kind, has none of the sympathetic ganglia belonging to the fifth. The eye is without its muscular iris, the ear without its tympanic muscle, the nostril without its moveable palate.

3. Wherever we do find a distinct and essential connection and association between the organic actions of a part and the contraction of some special muscle or muscles, there we also find a distinct sympathetic ganglion superadded to that of the fifth. *e.g.* The ophthalmic ganglion exists only when the organic actions of the eye need to be associated with the contraction of a *sphincter iridis;* the otic ganglion, when the organic actions of the middle ear with contraction of the *tensor tympani* and of other muscles; the acoustic ganglion, when the organic actions of the internal ear with contraction of the *stapedius;* the spheno-palatine ganglion, when the organic actions of the

nares and *velum*, with movement of the soft palate; the salivary ganglia, when the organic activity of the glands requires association with those muscles of the oral cavity which are supplied by the facial nerve.

4. But the converse does not hold good. The ganglion is not essential to the muscle. A muscle, for which a particular sympathetic ganglion is usually present, may yet exist without the ganglion. *e.g.* In birds and reptiles, an internal tympanic muscle exists without any otic ganglion. In them, the organic actions of the tympanum are not associated with the contraction of the muscle. In all those animals which possess an otic ganglion, they are. Hence the sympathetic ganglion is needed, not for the muscular contraction alone, nor for the organic action alone, but for combining the two.

5. As the muscle which is animated by a motor nerve from the sympathetic ganglion, when this does exist, is equally animated by a motor nerve non-gangliated, when the ganglion does not exist, we may infer that the ganglion does not constitute the centre of nerve-force for the motor nerve when the two happen to exist together.

6. The impressional portion of the fifth nerve sends a contribution to each of the sensorial sympathetic ganglia. There can be no doubt that this arrangement ministers to sympathy between the internal parts supplied by the sympathetic ganglion and the related external parts supplied by the fifth nerve; at the same time that, by concentrating the impressional nerve-tubes distributed to the senses at their encephalic terminations into one large nerve-trunk, it admits of readier reaction either of these nerve-tubes at their origin upon each other (impressional reaction), or of these nerve-tubes upon motor ones (motor reaction). Seeing that the motor reaction of several of the senses is particularly upon one nerve—the facial—the convenience of the arrangement is evident.

7. The glosso-pharyngeal and the vagus, which are the only other common impressional nerves of the encephalic, likewise send a contribution to each of the sensorial sympathetic ganglia, with the exception of the ophthalmic. In like manner to the above, will these contributions confer on the ganglia sympathetic relations with certain parts supplied by the two nerves of the eighth pair. The ganglia of the mouth, nostrils, and ear are the especial servants of the mucous membrane, and can scarcely be too closely associated with it; accordingly they receive the contributions referred to. The eye alone, from its delicacy of structure, refinement of action, and peculiarity of function, requires to be removed from what would be to it the deranging influence of direct nervous connection with the mucous mem-

brane. Hence the glosso-pharyngeal and vagus send no contribution to the ophthalmic ganglion. "*Exceptio probat regulam.*"

8. The impressional contribution of the fifth to the sensorial sympathetic ganglia is special and peculiar to each, having no relation to any other sympathetic ganglion. The reverse is the case with the impressional contribution of the two nerves of the eighth. This is in every instance related to more than one of the sympathetic ganglia. It will result from this that impressions may excite ganglionic reaction on the part impressed without interfering with the ganglia of any other parts, through the filaments of the fifth; but cannot excite it in one ganglion without calling forth the co-operation of others, when acting through the filaments of the eighth. On this distinction I found the view that the sensorial sympathetic ganglia belong to the fifth nerve, rather than to the glosso-pharyngeal or the vagus.

9. The motor element of each of these ganglia in every instance, is special and peculiar to its own ganglion, and has no relation to any other.

Note.—Bazin, writing in 1841 (Du Syst. Nerv. Paris, p. 47), states, "there is a little mass of grey matter, or a ganglion of the fifth pair, situated on the internal face of the trunk of the infra-maxillary nerve, at the point where it emerges from the oval foramen, which has not previously been described." Santorini and Girardi had, in 1775, described the conjunction of the *portio minor* of the fifth with the infra-maxillary branch on their emergence from the *foramen ovale* as a "true gangliform plexus." I had myself distinguished ganglionic corpuscles in a microscopic portion taken from this point. On these grounds, I inferred that there was here a small ganglion of the fusiform kind, and I enumerated it in my classification accordingly. On making further examinations with greater care, I find I was in error. There is no ganglion here distinct from the Gasserian, which, however, in some subjects, sends down a grey process through the oval foramen; and this, I presume, must have been the source of the corpuscles which had previously deceived me.

HOLMES CHAPEL, CHESHIRE,
May 15th 1848.

ART. IV.—*Cases of Recovery from Poisoning with Chloride of Zinc, and the Suggestion of an Antidote for this Poison.* By THOMAS STRATTON, M. D., Edin.; Licentiate of the Royal College of Surgeons, Edinburgh; Honorary Member of the Highland Society of Canada; Member of the Toronto Medico-Chirurgical Society; Corresponding Member of the Quebec Literary and Historical Society; Member of the Montreal Natural History Society; Surgeon, Royal Navy, Particular Service.

WHEN chloride of zinc is exhibited internally, its medicinal dose is from half-a-grain to two grains, two or three times a-day. It is used in lotions in the strength of two grains to one ounce of water, and stronger than this for some purposes. The following cases of swallowing in mistake a quantity of a solution of chloride of zinc lately occurred in Montreal.

CASE I. *November* 4, 1847.—In a house where I had been residing, 61 Craig Street, there was a quart-bottle containing a weak solution of the chloride of zinc. It was suitably labelled, with "Poison" written on it in addition. Elizabeth R, a servant, aged 17, supposing that the bottle contained whisky, put its mouth to her lips, and drank off about a wine-glassful. She instantly felt she had made a mistake; she experienced pain and nausea, and another servant gave her some milk. She immediately vomited very freely. She felt indisposition and want of appetite for three weeks after. She was not seen by any medical man, as shame kept her from speaking of the occurrence till a month after, when I saw her. Supposing that she swallowed two ounces of the solution, I have reason to think that she took twelve grains of chloride of zinc.

CASE II. On 4th May 1848, at 163 Craig Street, James C., aged 54, a stout healthy man, much heated, at noon, took up a quart-bottle containing a dense solution of chloride of zinc. It was properly labelled, with "Poison" also marked on it. He fancied the liquid was whisky, and, putting the bottle to his mouth, drank off (as he afterwards told me he supposed) about a wine-glassful. Now a large wine-glass contains two ounces and five drams, and supposing that he swallowed two ounces of the solution, I have good reason to think that he took four hundred grains of chloride of zinc; but from the nature of the liquid it perhaps is unlikely that he swallowed more than one ounce of the solution, or two hundred grains of chloride of zinc. From the size of the mouth of the bottle, it is not likely that he took less than this, which is one hundred times more than the medicinal dose.

He instantly felt burning pain in the gullet, burning and griping pain in the stomach, great nausea, and a sense of coldness. In about two minutes he left the house, and vomited freely in the street for about fifty yards, when he came to a friend's house, where he lay down, and continued to vomit or endeavour to do so. I was requested to see him, and arrived about twenty minutes after he had taken the poison. There was severe burning and twisting pain in the stomach; nausea and vomiting; the legs were drawn up on the belly; cold sweating; alarm and anxiety; pulse 45, small, weak. I instantly made a strong solution of home-made brownish soap, and gave him a quantity of it. He vomited every two or three minutes, and in the intervals drank of the soap-suds, of which he had altogether three or four pints. He also had warm water. The matter vomited was quite free from odour, as I showed to Dr Winder and Dr Mount, who were present. He now felt much easier; there was not much stomach-pain, except on pressure; the pulse was 50; less coldness. I sent him home in a cab, in which he vomited at intervals all the way. I ordered twelve leeches to the epigastrium, and an ounce of olive-oil every hour.

Five, P. M.—Has vomited several times after the olive-oil; no particular thirst; tongue moist; pulse 60, natural fulness, soft, weak. They could not obtain leeches. A sinapism to the epigastrium. Half-an-ounce of olive oil every two hours. An ounce and a half of castor-oil.

May 5. Slept a little. Stomach is easier to-day; still some heat, and pain on pressure. He applied a second sinapism, which gave great relief. Has vomited several times soon after taking the olive oil. Tongue dry; thirst; one fetid stool; pulse 72, soft. Repeat the castor-oil. Continue the olive-oil every four hours. A blister, five inches square, to the epigastrium. Linseed-tea and water for drink. No food. In the afternoon he vomited four pieces of membranous-looking substance, about three quarters of an inch square. They were not kept for me to see them, but, from the description, they probably were shreds of mucous membrane.

May 6. Blister rose well; no pain internally to-day; tongue red on tip, brown on edges; pulse 80, small, soft, weak; thirst; two fetid stools; no vomiting. Omit the olive-oil. An ounce of castor-oil in the morning. Cold water only for drink.

May 7. Got up.

May 8. Three fetid stools; no vomiting; no pain on pressure over the abdomen; some appetite; pulse 60; tongue moist, white; weakness.

May 10. Appetite pretty good; no uneasiness in the stomach.

May 12. Appetite improving.

May 15. Appetite, digestion, and strength are the same as usual.

May 30. He continues in perfect health.

On the first day the patient was seen also by my friends Drs Winder, Mahony, Hall, and Mount; and several times after, when I visited him, I was accompanied by Dr Winder.

Remarks.—The solution of the chloride of zinc was not made by myself, but supplied to me, so that I am not quite certain of its strength. I have good reason, however, to think that its strength is what I have stated above. The first patient took some of a diluted solution, and it is worthy of notice that she suffered from anorexia for three weeks; while the second patient, who took a much larger dose, recovered his usual appetite in much less time, probably from his having had administered to him the proper antidote,—whereas the other did not apply at all for advice. As chloride of zinc has great deodorizing power, I took the opportunity of observing that the matter vomited in the second case had no odour, which probably arose from the chloride of zinc. I was careful to observe whether the stools were fetid; and their being so was perhaps some proof that none of the chloride had passed lower than the stomach.

Antidotes.—Some time ago, on washing my hands with soap after having had them in chloride of zinc solution, I observed that decomposition took place; and I thought, in the event of any one swallowing, in mistake (or otherwise), an over-dose of that salt, that either soap, or carbonate of soda, or carbonate of potash, would be the proper antidote.

I took a clear solution of carbonate of soda, and added a clear solution of chloride of zinc. There was formed chloride of sodium or common salt in solution, and carbonate of zinc was precipitated.

To a clear solution of carbonate of potash I added a clear solution of chloride of zinc. There was formed muriate of potash in solution, and carbonate of zinc was precipitated.

To a solution of soap I added solution of chloride of zinc. The fat or oil in the soap became free, and was mixed in the mixture in roundish and oval pieces. There was formed muriate of potash in solution, and carbonate of zinc was precipitated.

With regard to the requisite quantity of the antidote,—as soon as an over-dose of chloride of zinc enters the stomach, one of its first effects, fortunately, is an emetic one; but, perhaps, cases will occur where, from the stomach being overloaded, or from some other cause, vomiting will not take place, before the physician reaches the patient. In such a case, for a drachm of the chloride of zinc, the proportional antidotal dose is,—either a drachm of the carbonate of soda, or a drachm and a half of the carbonate of potash, or six drachms of soda-soap, or nine drachms of potash-soap (as in soap there is from six to ten per cent. of either soda or potash).

In nearly all the cases it will be found that vomiting occurs in a minute or two after swallowing the chloride, so that much less than the above quantities of antidotes will suffice. It is exceedingly convenient to have an antidote in soap, which is always to be had in houses without delay.

Even where soda or potash is at hand, as well as soap, this last seems preferable, as its oily part is useful either as a soothing application to the irritated mucous membrane, or, as an emetic. Castor-oil may be prescribed to carry off any of the poison which may have passed the stomach. Olive-oil for a day or two is soothing to the mucous lining of the œsophagus, &c., and sinapisms or a blister to the epigastrium appear to be all that is required.

Chloride of zinc given inwardly, in medicinal doses, is useful in chorea, epilepsy, neuralgia, &c. In surgical practice, it is useful as a caustic and escharotic, and, applied externally in a weak solution, it possesses alterative, stimulant, and deodorizing powers on certain ulcers, where it has the great advantage over mercurial, arsenical, and lead preparations, " of not giving rise to constitutional disorder from absorption."*

A peculiar solution of chloride of zinc (Sir William Burnett's Disinfecting Fluid) is largely used to preserve timber, canvas, and cordage from decay, and also for various hygienic purposes, and to preserve animal preparations, and for its deodorizing and disinfecting properties; and this solution, used in the manner directed, is perfectly innocuous.

I have looked into seven or eight of the latest works on materia medica and toxicology (being all within my reach), and have not found any antidote mentioned for chloride of zinc. In one† of these works, there is, in parallel columns, a list of poisons and their antidotes, and that for chloride of zinc is left blank; so that, as far as I know, I am the first who has pointed out and who has used the proper antidote for this poison.

MONTREAL, CANADA,
31*st May* 1848.

ART. V.—*On the Signification of Fact in Medicine, and on the Hurtful Effects of the Incautious Use of such Modern Sources of Fact as the Microscope, the Stethoscope, Chemical Analysis, Statistics, &c.* By WILLIAM SELLER, M. D., F. R. C. P. E., one of the Extraordinary Physicians to the Royal Infirmary of Edinburgh, &c. Read before the Medico-Chirurgical Society of Edinburgh, February 2d, 1848.

IT is perhaps true that there cannot be two opinions as to what constitutes fact, either in medicine or in any other department of science. Whatever is termed fact, every one is ready to exclaim, must be an absolute truth, unadulterated by any admixture of error. Of truths of this kind, beyond all doubt, the actual order of nature is made up,—of truths which are facts in the arrangements of the universe and of all its parts, inorganic and organic. But it is not less true, that it is from a mere abstract conception of truths of this kind, in the economy of nature, that our principal idea of the term fact in science is drawn; and this being the case, is it not plain that we come to apply a term framed on our conceptions of the perfection of nature to appearances more or less contaminated with the imperfections of human observation? Thus, what are called facts in human science, do not necessarily represent with exactness the facts of nature. Our representations of the facts of nature, though termed facts by courtesy, may, and often do, involve errors of very material moment. Notwithstanding the proverbial authority of the direct observations of sense, there were not wanting unsuspected errors in what were upheld as facts, even in those early times when the interrogation of nature was carried on solely by the unassisted use of the senses; and therefore there would be less advantage than might be expected, were the term fact confined to observations made in this simple manner. But, in the actual state of science, it is indeed impossible to limit the term to phenomena so easy of determination. As knowledge advances, nature must be scrutinized by more refined methods than belong to its earlier progress, and then truths, or supposed truths, which are exactly parallel, and in every way strictly analogous to the immediate observations of sense, come to be ascertained,—some, for example, by the assistance of a more or less complex apparatus,—others by inference from a larger or smaller succession of phenomena,—others by numerical methods of research,—others, again, by deduction from a previously-established general principle or law. Truths so determined, though currently termed facts, can seldom be at first unmixed with error. Organic nature, above all, with which almost exclusively medicine has to deal, illustrates, in particular, the difficulty of reaching truth of fact otherwise than by successive approaches. But in every department of science, it is only the most gross and palpable truths that are discovered at once without any admixture of error. Whenever there is complexity, the approach to truth must be gradual, even when that truth is most unequivocally a fact. What can be more purely a matter of fact than the place of a fixed star in the heavens?—yet of how many errors must the earlier determinations be cleared before its actual position be ascertained with precision?

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* Wood and Bache's United States Dispensatory, 1847, page 1215.

† Dunglison's General Therapeutics. Philadelphia, 1846. Vol. ii. p. 415.

No doubt it might be said that such truths as the place of a fixed star are, from the beginning, facts in the order of nature, but that these do not become facts in science till determined beyond the reach of error. This is to introduce a distinction between facts in nature and facts in science, which would be a source of endless confusion. It is better to take things as they are, and to speak of what are plainly facts in nature, as facts in science also,—yet, with this reserve, that though parts of science, they may still fall short of being absolute truths.

Much confusion, however, could not fail to result, if effects referred to a cause were included under the head of facts, as sometimes happens from inadvertence. The distinction is for the most part easy. The phenomena of inflammation, as determined by the microscope, namely, the narrowing of the capillaries and the more rapid motion of the blood, followed by the dilatation of the capillaries and slow motion of the blood; its oscillation and final stagnation; and lastly, the exudation of of the *liquor sanguinis* through the walls of the capillaries,—are plainly facts, or supposed facts. But it is not a fact that inflammation is cured by blood-letting: it is the expression of an effect referred to a cause. In like manner, it is not a fact that colchicum relieves gout and rheumatism, or that sulphate of quinine cures agues; nor is it a fact that the stimulus of the blood makes the heart contract. All these are not facts, but alleged effects. The vesicular breath-sound in the healthy lung, the friction-sound in pleuritic inflammation, the crepitant rattle in inflammation of the substance of the lungs, pectoriloquy in excavation of these organs, are simple facts under the use made of them in practical medicine; though, when in the theory of the stethoscope an attempt is made to account for them by pointing to the several physical circumstances corresponding to each, they immediately become effects. Yet by becoming effects, they do not cease to be facts; since, when things truly stand in the relation of cause and effect, the cause is a fact, and the effect is a fact, though the relation between them is not a fact, being the result, not of a knowing but of a judging faculty. But to continue. It is a fact that the colourless part of the blood-clot is the same substance with the fibrine of the muscular tissue, circuitous as is the process by which this is determined. It is not, however, a fact, but the alleged effect of a cause, that this same fibrine is a principal part of the nutriment of living bodies. It is a fact that more males are born than females. It is not a fact, but only an alleged effect, that ergot of rye dilates the uterine orifice, or that chloroform abolishes the pangs of child-birth. It is a fact that John and

Peter must die, while it is only an alleged effect that exercise and temperance are favourable to longevity.

It is not, indeed, very material by what name a piece of knowledge is called, provided its truth be beyond question. And the only real use of such views as I have been insisting on is to put us on our guard against being misled by words,—to keep before the mind the possibility of statements loosely passing for facts, containing a greater or less amount of error.

It must be plain, then, from the instances just referred to, that modern medical facts are apt to differ widely from the simpler facts of early times, being of a much less absolute character, and free from error only in proportion to the perfection of the methods of research employed. Hence the necessity, so much overlooked, of a continual retrospect to the so-called facts forming the foundations of medical theories, for the purpose of amending their deficiencies, and pruning them from error. And hence also the necessity, to borrow an illustration again from the language of astronomy, of taking pains to understand the theory of our instruments of research, whatever these may be, so as to become acquainted with their laws of error, and thus to anticipate the corrections necessary on their results.

In proceeding to consider the hurtful effects of the incautious use of the several modern sources of medical facts before referred to, I wish to call the attention of the Society not merely to the evil of mistaking imperfect observations for absolute truths, owing to defects inseparable—at first, at least—from such instruments of research, but in particular to the much more mischievous consequences of an overweening estimate of the practical value of the knowledge derived from these sources, as compared with the accumulated truths of medicine throughout past ages. I am very far from underrating the importance of any one of these methods of research as regards the future progress of medicine. Each of them is plainly capable of making incalculable additions to medical science. But though the seed be sown at present by many labourers, the harvest is far distant. And what we have to complain of is, that the more ardent partizans of these several methods continually mistake this distant prospect of harvest for a great present advantage. They contrast their mere conception of what medicine is to be, ages hence perhaps, when it shall have exhausted all the aids of their chosen methods of research, with its present imperfections, and ask us triumphantly to adopt at once a new phraseology, new doctrines, and new methods of treatment, as if the medicine of past times contained nothing worthy of any further serious attention.

It is already apparent that microscopic medical facts are slowly changing the whole aspect of pathology. And it is not easy, I freely confess, to overrate the benefits which the microscope promises to confer on medical science. But the greater its capacity for good, the greater also is its tendency to evil. The microscope takes up anatomy, healthy and morbid, where the simple use of the scalpel fails us. It would be superfluous to insist on the inestimable services which anatomy, normal and pathological, has rendered to medicine. And as an instrument for the enlargement and extension of this kind of knowledge, the microscope is justly upheld as of unrivalled utility. But if common morbid anatomy had been all along confined to its proper sphere, the other important aids of pathology being permitted to retain their due influence, medicine would have proceeded more steadily in an onward progress. Morbid anatomy for a time usurped exclusively the name and office of pathology; diseases were seen only through this medium, and the rules of practice were bent into conformity with its crudest suggestions. It was a common error—one not yet wholly exploded—to mistake the effects and occasional complications of a disease for its actual essence, thus rashly converting the proximate causes of the old pathology into sensible alterations of tissue. Inflammatory action was for a while recognised as the root of maladies in general; fevers were idiopathic inflammations; hemorrhages were inflammatory; dropsies were inflammatory; asthma was inflammatory; dyspepsia was inflammatory; the gastro-enteritic tendency was the ruling morbid character; while the lancet, leeches, cupping, and saline purgatives were the almost exclusive weapons of the practitioner; narcotics, astringents, tonics, and especially chalybeates being regarded with horror as little short of instruments of assassination. Microscopic morbid anatomy, if left uncontrolled, threatens us with a similar train of erroneous views on the subject of the essence of diseases, and the like deviations from sound precepts of practice. But it would be inexcusable if, having just felt our escape from the trammels of views entailed upon us by the incautious application of common morbid anatomy to the investigation of diseases, we should plunge into errors in every respect analogous by a like blindness in the use of microscopic knowledge of the same kind. While, then, all due weight is given to microscopic discoveries, let us insist that every innovation shall be rigidly scrutinized before being adopted in contradiction of any long-received view of the old pathology. And in making this scrutiny, let it not be forgotten—1, that admirable as the microscope is continually proving in diagnosis, it does not therefore follow that it is a safe guide to rules of practice; 2, that the sensible alterations of tissue made by diseased action are but a small part of pathology; 3, that the whole effect of the variation of external circumstances on the course of diseases, including the *juvantia* and *lædentia* of the old schools, should decidedly control the practical conclusions drawn from such alterations of tissue; 4, that medicine still is, and must continue for ages to be, an empirico-rationalism; 5, that the day of a purely rational practice is far distant, being rather a day of hope than of certainty; 6, and that the attempt to cultivate medicine as a system of pure rationalism has invariably proved the highway to error.

The limits of this paper preclude me from entering into any lengthened illustration of what is here laid down. The single example I propose to offer is chosen for its general nature, rather than on account of having any very particular adaptation to the point under review.

One of the most striking effects of the microscope on the study of diseases arises from the discovery of sensible alterations of tissue in affections hitherto regarded as functional. But the distinction of diseases into functional and organic is one of the principal features of the old pathology. This distinction the microscope threatens to subvert and render useless, because the diseases which it shows, and is hereafter likely to show, as organic, essentially differ from those hitherto designated by that term. Now, before we consent to the virtual abolition of a distinction so well founded as that of diseases into functional and organic, it is proper to consider whether the new light promised by the microscope do really necessitate the sacrifice. The microscopist, doubtless, will exclaim, How can you retain amongst functional disorders maladies which are proved to consist in an organic lesion? To this it might be answered, that it would be better to do so than to sacrifice pathological truth to mere propriety of words. But it is obvious, that an arrangement may continue to rest on characters the most perfectly natural, though the progress of knowledge may have rendered the terms originally bestowed on it inexact or literally inapplicable. An arrangement is justly described as natural when the members of the several divisions agree with each other in many more particulars than that to which the name of each group points. Do the members then, of the two groups in question, possess any other striking feature in common besides the dependence of the one on a sensible lesion of structure, and the absence in the other of any such lesion? The ready answer is, that organic diseases, in the original sense of the term, are incurable, while functional diseases are curable. And the real difference between functional and organic diseases turns out to be, that the one order of maladies is dependent on internal changes susceptible of being removed by living action, while the other consists in the presence of permanent alterations. Thus the old distinction holds its ground on a practical basis. And the proper object of the microscope should be, not to introduce confusion into the older system, but to point out, among the alterations which it discovers in the tissues, what are transitory and what permanent, these being disposed of under appropriate names in groups corresponding to the ancient arrangement.

This, however, is not the view taken by most microscopists. They are apt to regard the discovery of a structural alteration in a disease before termed functional, as a triumph of the microscope over the old pathology—as the detection of an error—as the application of a new principle. But their triumph is premature; they have merely discovered a new fact in the history of the disease, they have realised what before lay only in speculation. For the old pathology never denied that the so-called functional diseases depended on physical alterations. It was never taught under any system of medicine, that deviations from health could manifest themselves without a corresponding physical change on the tissues of the organ or part concerned. The old pathologists believed in the existence of a change, though they could not detect it. And even when the change was manifest, they referred it, if transitory, to functional diseases. Inflammation, for example, even in its earliest stage, implies important physical alterations in the affected parts; yet at least this stage of inflammation, has been always considered of a functional character. Hepatization of the lungs, as a physical change, is as great as most of the changes likely to be detected by the microscope in the so-called functional diseases; yet being removable, no one has thought of placing it among the organic diseases of the chest. Even the humoralists could not have denied the dependence of diseased action on structural changes, provided it had been first explained to them, that the microscopists pique themselves on the small verbal novelty of representing vitiations of such fluids as the milk, the blood, &c. as being alterations of structure.

The microscopists, no doubt, may urge, that the changes of tissue corresponding to the old order of organic diseases, are permanent only on account of the extent to which the morbid action has proceeded, and that, in its first stages, it is capable of being removed by the excitation of living power. But this is not a kind of reasoning which avails in practical medicine. The peculiarity of an organic disease, in the old sense of that term, is less in the action by which it originated, than in the effect of the ultimate change of texture on the function of the part itself or adjacent organs. Such a disease, in its matured state, that is, when termed organic according to the old rule, is a very different disease from what it was at the time when its beginnings could have been controlled by a knowledge of the morbid action in which it took its rise.

Thus, under whatever aspect this subject is viewed, it is still apparent, that the expressions transitory morbid alterations and permanent morbid alterations hold the same relation, and preserve the same correspondence to each other, as the older terms functional diseases and organic diseases, and that these last terms, though inexact, refer to a pathological distinction of much utility on which the microscope should not be suffered to encroach.

The next modern source of medical facts to which I refer is the stethoscope. As respects this instrument, I merely wish to notice the tendency which it, as well as the microscope, has to introduce confusion, by more or less altering the sense in which many terms used in the old pathology of the chest were received. One example will suffice to show the nature of this confusion. Thus, the peripneumonia of former times differs essentially in many respects from what may be termed stethoscopic peripneumonia,—that is, from peripneumonia which is not discoverable without the aid of auscultation and percussion. The effect of the use of the stethoscope has been to increase very greatly the number of cases of disease referred to peripneumonia. While the general symptoms were relied on, many cases of peripneumonia must have escaped detection, being considered as catarrhal fever, common cold, or ordinary febrile disturbance. And, as in most of these cases the symptoms had disappeared under confinement and slight treatment, no suspicion arose from any untoward result of an oversight having been committed. Thus the term peripneumonia was restricted till of late to cases of severity and danger—to those cases in which the lung was affected to no small extent, and the constitutional reaction proportionately great, as indicated by oppression of the breathing, often amounting to orthopnœa, cough, turgescence and lividness of the countenance, and much febrile uneasiness. The disease was always accounted both difficult of detection, and of the most dangerous character; and the danger was justly held to be extreme if it ran its course undiscovered. But the stethoscopic peripneumonia, taken in its most restricted sense, is far from coming up to this character. It is a disease in which the patient may suffer but little, which often passes away spontaneously, or is cured by slight treatment. Or, if this should appear to be a statement which underrates its severity and danger, it is at least true that cases are at present published almost daily of peripneumonia detected by the stethoscope, which disappeared under the most moderate treatment. And there is no good reason to believe that any considerable proportion of the cases of peripneumonia, which in former times escaped detection, owing to the defect of the then recognized signs, had a fatal event. The treatment appropriate to the trivial affections they were taken for sufficed in general for their cure. What is here said, however, is not to be understood as having any reference to the dangerous form of the disease, which is strictly termed latent peripneumonia. Here the peculiar merits of the stethoscope are conspicuous. The general symptoms do not fail to arise, owing to the small degree and extent of the inflammation, but from a defect of the power of reaction in the system, the result of some previous or simultaneous disease. With this exception, the old physicians seldom failed, if not to detect with certainty, at least to suspect the presence of the more dangerous forms of peripneumonia. It is one of the diseases which they looked for with an anxious eye; they knew its obscurity; they knew its danger; and they allowed no suspicious cases to run on without resorting to what would be considered at present as an excess of the antiphlogistic treatment.

Pure peripneumonia, in the old pathology, was regarded as rather a rare disease; it was best known in its combination with pleurisy, as pleuro-pneumonia. Stethoscopic peripneumonia is more frequently pure than the old peripneumonia. This is what might have been anticipated. But neither is it to be forgotten that pleuro-pneumonia, the most frequent form of the old peripneumonia, is more dangerous than simple peripneumonia, and that the implication of the pleura very uniformly denotes a greater extent and severity of the pulmonic inflammation.

From these considerations, it obviously follows that the stethoscope has attached essentially new ideas to the word pneumonia or peripneumonia. And, therefore, in estimating the opinion of our predecessors on any point connected with this disease, if we use that word in its new sense, when it should be used in the old, we fall inadvertently into the well-known sophism which substitutes one idea for another by changing the import of an essential term in any proposition. And hence, whoever should say that our predecessors, being ignorant that peripneumonia often subsides under mere regimen and nominal treatment, used remedies of too active a character, would erroneously assert that to be true of the old peripneumonia which is true only of the new. And if it be the case, as many considerations seem to prove, that highly active inflammations of the internal organs have been much less frequent of late years than at some former periods, then this reasoner would be guilty of at once extending and contracting the signification of the original term peripneumonia, by using it at first to include stethoscopic peripneumonia, which had never been in former times included under it, and then to exclude thoracic inflammation with very dangerous constitutional reaction, which it had been originally employed to denote.

And the next step is the erroneous and dangerous inference, because stethoscopic peripneumonia, which has been known but for a few years, yields to regimen and simple treatment; that, therefore, peripneumonia, in general, may be at all times safely allowed to run on without active treatment.

Like the microscope, chemical analysis has much enriched, and, in the highest degree, promises still further to enrich, the science of medicine. The additions supplied by chemistry come unquestionably under the denomination of facts. They are facts not directly observed, but determined by inference from a succession of phenomena. Such truths, therefore, are liable, particularly on their first announcement, to an admixture of error proportioned to the complexity of the processes by which they have been deduced. This is not a reason for rejecting their aid in medicine, but merely one for accepting it with due precaution.

But what we have most to fear from the over-ardent application of chemistry to medicine, are the errors resulting from the spirit of system. The humoral pathology owed its prolonged existence and repute among the physicians of its later days to the hope of rendering chemistry available for the purposes of pathology. Chemistry was then, however, utterly inadequate to the task. Even now, organic chemistry is far from being sufficiently advanced to have any just pretensions to supply a system of chemical pathology and treatment. It is easy to predict that it must continue for many long years in a humble state of subordination to the prevailing empirico-rational medicine. A sober thinker can hardly venture to look forward to such an advanced state of chemical rationalism as would be sufficient for pronouncing *a priori* that sulphur could cure scabies, iodine goitre, citric acid scurvy, or carbonate of iron neuralgia. Chemistry might perhaps have boasted at the present moment of having discovered iron to be a remedy in chlorosis, had not empirical medicine anticipated that discovery by a long lapse of years. This science has afforded antidotes to poisons, and has shown alkalies to be the proper remedies for the uric acid diathesis, and certain acids for the phosphatic diathesis. But such additions to medicine are not the fruit of organic chemistry, but merely obvious applications of facts in inorganic chemistry. To chemistry—perhaps I should say to organic chemistry—we are indebted for the characteristic symptoms of granular disease of the kidney, the coagulability of the urine, its low specific gravity, the defect of urea; but chemistry does not supply the remedies for this disease, these being drawn exclusively from the principles of the empirico-rational medicine of the day. That colchicum augments the proportion of urea in the urine, is a fact we owe to chemistry; and it will be recollected that Dr Douglas Maclagan read to the Society, the summer before last, an interesting case of urticaria in one of Dr Scott's patients, accompanied by a deficiency of urea in the urine, which being augmented by the administration of colchicum, the disease subsided. This is the kind of field in which chemistry promises to be of immediate service in the practice of medicine,—that is, not as offering us a rational chemical pathology, but as enlarging the sources from which empirical rules are to be drawn Here, though the fact on which it rests be supplied by chemistry, the treatment is empirical, not rational, the immediate object being simply to increase the proportion of urea in the urine. Nor is there any hope that in our times the means will be afforded of determining *a priori* such truths as that colchicum augments the proportion of urea in the urine.

We may, indeed, already look forward at no very distant time to the establishment of partial chemical rules for the preservation of health, and for the exact chemical treatment of many diseases, particularly of those in which the urinary function participates. But we shall be deceived, if we expect that chemistry will soon teach principles, which can be acted on independently of what mere experience has taught in past ages in reference to the general management of health, and the treatment of prevailing diseases. For example, the proteine theory, so beautifully applicable in appearance to all the circumstances of alimentation, is still a much less perfect rule for the preservation of health than the common wayward experience of mankind. It may truly teach that the vegetable kingdom manufactures, from the inorganic matter of the earth's surface, a primary organic substance which in its essential composition represents the blood and flesh of animals, which substance in some of its forms must be supplied to animals in quantity proportioned to the daily waste of their bodies, otherwise they perish. But there are manifestly other conditions necessary to healthful alimentation besides a due supply of proteine; and till these conditions be completely brought out, science must be content to bow to vulgar experience. And the case of the proteine theory exactly represents too many of the cases in which the over-sanguine partizans of the new pathology already proclaim the triumph of science over the old empirico-rationalism. The proteine theory does not confine itself to health. It already aims at expounding the theory of diseases. But we are much deceived, if any better rules for the treatment of fever and inflammation will be discovered in our time, from the knowledge that the state of fever augments the quantity of oxidized proteine in the system, that the state of inflammation is one of the consequences of this augmentation, and that blood-letting is serviceable by evacuating this peccant matter. Here there is example enough of the rash application of chemistry to pathology.*

That the progress of organic chemistry is destined to clear up many difficulties in pathology, it would be absurd to dispute. But it is too soon to speak of this science giving a decided turn to the theory and practice of medicine. The chemistry of the living body is a chemistry altogether *sui generis*;—its laws and principles can resemble nothing that is known out of organic nature. These, then, must be sought by long and laborious efforts in the living body itself; and in seeking for these, the established principles of the earlier chemistry will oftener mislead than assist, or there can hardly be too little trust put in the suggestions of inorganic chemistry. Pathology cannot profit much by this higher grade of inorganic chemistry till physiology by the same means has made long strides beyond its present state. And no spirit of prophecy is required to pronounce, that any attempt at present to found practice largely on a chemical rationalism will only issue in error and disappointment.

The next subject for our consideration is the search after new medical facts by the numerical method, or by statistical inquiries. The evidence of statistics seems, at a first inspection, so very simple and certain as to defy error. And in many cases, with no other care than some provision against positive blunders, it is unerring. In a given place, within a given time, any one may reckon up the number of births and the number of deaths, and, migration on either side being allowed for, may thus deduce the rate at which the population is increasing or decreasing. Again, it is easy to count up the male births and the female births in a place within a certain time, and thus to test the proportion alleged to exist between these in civilized countries. And in both these inquiries, mere blunders apart, perfect certainty is attainable. And this certainty is here attainable simply because it is impossible for any one to misunderstand, confound, or misapply the terms "birth," "death," "male," "female." But let the inquiry turn on the number of cases of pneumonia, phthisis, croup, asthma, pericarditis, peritonitis, gastro-enteritis, or any like diseases which have occurred in a given time under the care of several different practitioners, then the result will approximate to the truth only in proportion to the agreement between them as to the nomenclature which they have adopted, their general skill in diagnosis, the pains bestowed by each, and the opportunities afforded for overcoming the uncertainties of medical opinion. And if the inquiry be conducted on such a plan as that on which the ancient London bills of mortality were made up, when the old-women searchers in each parish determined the name of the disease which had caused death from the description given of its symptoms by the relatives of the deceased, then it will be problematical whether truth or error be predominant in the result.

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* See Simon's Chemistry, by Day, Vol. i. p. 12.

It may indeed, at first sight, appear, that all the received aphorisms and precepts in the history and treatment of diseases, usually described as the result of past medical experience, are founded on a species of statistics differing from the statistics of modern times only in being of a looser character. But if we consider the origin of aphorisms and practical rules in medicine, we shall find them to rest on a foundation somewhat different from that of mere statistics. They owe their value to the sanction of authority. It is not every one who practises medicine, that is competent to make observations fit to be generalized into maxims and precepts for the use of succeeding ages. The most valuable of these we owe to the experience of the Magnates of the profession. In ordinary statistics every record is of equal weight, by whomsoever made and howsoever erroneous; and the several records which make up the aggregate being usually taken by a number of persons who cannot be placed so much under the same exact circumstances at each observation as the single authoritative observer in the individual observations from which he generalizes his precepts, there is much wider scope for errors of misapprehension and misapplication, both as to names and things, in the former case than in the latter.

The great bulk of practical medical knowledge is obviously the fruit of individual minds naturally gifted for excellence in medicine. And the axioms and precepts so originating, when made known to the medical world, having been found to be in accordance with the experience of others, have acquired the additional sanction of time and numbers. There can be no doubt that a great proportion of the medical knowledge which comes under this head is true, and as little doubt that some par-of it is erroneous. And the grand obstacle in the way of improvement is the difficulty of separating the chaff from the grain. It was erroneous knowledge of this kind that Cullen complained of when he said that "false facts" are more common than false theories. The same would form a principal part of the material for that revision of medical opinions which Cabanis proposed as the first step towards a reform in medical science. Such a revision, however, could not be made in one age; it cannot be accomplished otherwise than by the slow growth of medical improvement; and any attempt at an immediate revisal of the kind suggested by Cabanis, though it might make extensive changes on the face of medical science, would probably but substitute new forms of error for the old errors which it threw aside.

At all events, the evidence of statistics can in no case be deemed adequate to overturn the long-received maxims and precepts of practical medicine, unless when the basis of observation is unimpeachable, and the ideas and terms concerned are so simple as to be incapable of misapprehension.

And when any attempt is made to render statistics available for the solution of complex questions in medical science, no pains must be spared for the thorough understanding of the numerous sources of fallacy incident to this kind of inquiry; and though the utmost vigilance be exerted to prevent their intrusion, it will not uniformly be successful.

Sometimes the blunders that may be committed in the mere mechanical part of the inquiry are of a kind so obscure as to pass for a time unobserved. Of this description was the blunder formerly made in the estimate of the mortality in prisons, namely, dividing the number of committals by the deaths. The result thus obtained is so favourable to the healthiness of prisons, as to have led a French minister to pronounce prisons the healthiest places in the world, and an English inspector gravely to affirm that "in very few situations of life is an adult less likely to die than in a well-conducted English prison." Only one in 500 prisoners dies; "so, according to this view," says Mr Farr, "if a man desire to live to the age of Methuselah, he should go to Newgate." The inmates of a prison, however, are, on an average, renewed nearly eight times in the year. One in 500, therefore, represents the mortality not for 365 days, but only for something between 40 and 50 days, or the eighth part of a year. But if one in 500 be the mortality for the eighth part of a year, it represents a mortality per annum among the persons confined of 8 on 500, or 16 on the 1000,—which is more than one-half greater than the mortality of the population of England in general at the average age of prisoners.

We have had recently, in the Edinburgh newspapers, an example of a very common kind of fallacy in statistics, referring to the mortality of the present epidemic in the Infirmary. The facts mentioned are perhaps correctly stated, but as professing to illustrate the mortality of the epidemic, they are wholly deceptive. The objectionable part of the paragraph is as follows: "The number of paupers which the city parochial board alone has sent to the Infirmary since the first of June,—when the fever manifested itself as virulent and epidemic,—till Monday last (the 27th September), is 887, of which no less than 485 have died."* Here, by a common fallacy of statistics,—the taking a special part of the cases concerned to represent the whole,—the mortality of the present epidemic is made to appear to have been at that time between 50 and 60 per cent., while the most exact returns prove that the mortality on the whole, up to that time, had not exceeded 10 per cent. The great mortality on the cases sent in by the parochial board must have arisen from the miserable state in which the patients had lain, in lodging-houses and the like, during the first days of the attack. Many of them died a few hours after they were brought in, and some, on being carried to the wards, were found to be actually dead.†

Such circumstances as those just stated show how readily mistakes may be committed in comparing, by statistical returns, the mortality of one epidemic with that of another, or the mortality in one hospital with that in another, either as regards epidemic diseases, or the general mortality medical or surgical. In typhus, the disease in most seasons, as every one must have observed, falls much less severely on females and the young of both sexes, than on male adults, and is especially fatal to the old of either sex; and thus, when, in the general results, numbers alone are regarded, erroneous inferences are apt to be drawn from statistical returns as to very important points,—such as the effect of the treatment, the care bestowed by the attendants, the healthiness of the wards, and the like.

On the inferences apt to be drawn from the statistics of surgical operations, Dr Fenwick of Newcastle has made a very important observation. Speaking of the comparative success of different operations in amputation, he says—"I have seldom found the apparent success of any of our most celebrated surgeons commensurate with his reputation, but, on the contrary, have often observed those who have enjoyed the greatest name, number the largest amount of deaths amongst their patients."* And this he illustrates in the following manner:—Two surgeons have each six patients affected with gangrene; one amputates on three and recovers two of these, while the three left to nature die; the other amputates on all the six and recovers three,—thus he saves one more than the other, though as respects his success in amputation, he loses one-half, while the other saves two out of three. The application of this observation to the statistics of surgical practice is too obvious to require comment.

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* Caledonian Mercury, Thursday, 30th September 1847.

† The above statement has been allowed to remain as it stood at the time the paper was read; but in the discussion which followed, Dr Myrtle, one of the city parochial surgeons, expressed his belief that the newspaper paragraph was wholly erroneous, and that the number, 485, related not to the deaths from fever among the parochial poor in the Infirmary, but to the supply of coffins to all who had died within the parochial bounds of the city in a destitute state, in the period referred to. This turned out to be the truth; and then, at the end of four months, a contradiction was made in the newspapers, but not before this apparently official testimony to the great mortality of fever in Edinburgh had been copied into the continental journals, probably to make the round of Europe, with small chance of being followed by the tardy contradiction. Such are too often the precarious foundations of so-called statistical facts. The actual mortality of fever in the Royal Infirmary for the whole year 1847, was nearly 13 per cent.

A volume would not contain all the kinds of fallacy to which the rash application of statistics to complex cases gives rise. But as these can hardly be pointed out otherwise than by examples, I have one or two additional illustrations to offer.

There is a well-known proposition ascribed to Hippocrates, namely, that the age of pulmonary consumption is between 15 and 40 years of age. Out of this arises a question of importance to life insurance societies, namely, whether the risk of insuring the life of a person belonging to a phthisical family be much diminished after forty, as compared with the earlier part of his life. The general belief at present doubtless is, that the risk is little if at all diminished; and this belief is supposed to rest on statistics. It is not unlikely that this belief is well founded, yet the statistics relied on hardly touch the question. It is proved sufficiently by statistics, that, in the great hospitals of Europe, tubercular phthisis occurs at all ages. But the patients in these hospitals do not belong to the class of persons who insure their lives. And surely it is not impossible that phthisis might occur principally between 15 and 40 in the class of persons who live comfortably, notwithstanding that it has been found to prevail almost equally throughout life among the inmates of the hospitals in the great cities of Europe. For it is to be remembered that the inmates of these hospitals are to a great extent made up of an ill-fed, half-naked, houseless population, as well as of the many artisans victimised in such cities by employments in themselves unhealthy, or by being crowded together in ill-aired, over-heated work-shops. These conditions of life cannot but have a very material influence on the frequency of a disease which owes its origin so often to a cachectic state, induced by a disregard of the precautions necessary for the preservation of health. Before, then, the proposition of Hippocrates can be justly set aside, which applied, unquestionably, to persons living somewhat comfortably, like those who insure their lives, a new statistical inquiry would be requisite, limited to the class of persons concerned in the proposition. Though sufficient data do not at present exist to decide this point, Sir James Clark regards the proposition of Hippocrates as so far warranted even by modern statistics, that by far the largest proportion of phthisical patients are cut off between 15 and 40, though it must be confessed, that, according to the statistics on which he relies, a considerably greater proportion die of phthisis from 40 to extreme old age than between 15 and 40. On the contrary, however, according to the new London tables of mortality, the deaths ascribed to phthisis are between four and five times more numerous between 15 and 40 than above 40.

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* Monthly Journal of Medical Science, October 1847.

The examples hitherto produced have related to the use of statistics for the establishment of facts, or supposed facts of a positive character. But we find statistics sometimes resorted to for a use little short of the difficult task of proving a negative. When supposed facts are put forward on insufficient grounds, mere logic has no resource but simply to affirm that these should not be received because the proof has failed. But, unfortunately, in medicine, there always have been many things, which, though doubtful, having been at one time received and acted on as true, require a particular refutation before they can be wholly got rid of; and though such a refutation falls, as I have just said, little short of proving a negative, it has been attempted by statistics. It is manifest that such a proceeding is very likely to run into error. It is, however, on evidence of this kind that many persuasions of past times are now rejected; —witness the belief that marks and monstrosities in the infant at birth depend on affections of the mother's imagination during pregnancy. The refutation here, though far from having been carried out in a systematic manner, is justly held to be sufficient. But this is not the case in every instance. For example, statistics have been applied with much confidence, though hardly with due consideration, to the all-important question as to the period of gestation essential to the production of a viable child. On the faith of statistics, sometimes limited to the cases presented in the practice of one accoucheur, all the alleged instances of viability before the end of the seventh calendar month have often been authoritatively set aside. To assume *a priori* that, if exceptions occur to the observed rules, they must be met with out of a certain number of deliveries, be that number 1000, 5000, 10,000, or even 1,000,000, is an unwarrantable mode of reasoning. It should at least be shown that the exceptions to the ordinary laws of development cannot have place unless within the limits set forth. Few data exist for the explanation of the extreme rarity of some deviations from the ordinary development of the animal body. But if an exception be as it were grafted on an exception, and neither be of a kind to occur frequently, then the so grafted exception can be understood to be of extreme rarity. It is admitted, I suppose, that an infant not destined to reach maturity before the end of nine calendar months may be born accidentally at the end of seven calendar months and survive to adult age. But if it be a fact, as many think, that infants sometimes reach maturity considerably before the completion of the ninth month, then it is reasonable to suppose that an infant, thus prematurely developed, may be capable of living, though brought into the world accidentally, some time before the completion of seven calendar months. Thus, if it were the case, as maintained by Levret and others, that infants occasionally reach maturity of development as early as the end of the seventh month, then it would be possible that some of those precocious children might come into the world in a viable state at a date antecedent to nine calendar months, bearing a proportion to the difference between nine and seven; or, at so early a period as the 170th day—that is, ten days before the time fixed as the earliest by the Code Napoleon.

If to the difficulty here stated be added the additional difficulty that the term viability, so much used of late in inquiries of this sort, is manifestly far from being strictly defined, we shall be able to judge how much the question as to the minimum period of gestation of a viable infant is from being ripe for the application of statistics.

And it will occur to every one, that many questions stand in the same predicament with this.

In statistical inquiries, then, it should be an axiom, that the inferences cannot be more exact than the facts founded on. If the individual facts concerned be absolutely alike, as birth to birth and death to death, then the truth of the inference will be equally absolute. But there may be, as we have seen, among the individual facts, only an apparent resemblance, while a latent contrariety exists; they may be called by the same name, though they be far from being categorically alike, and thence the inferences become proportionately erroneous.

As to facts deduced from previously-established general principles or laws, the last topic to which I proposed to advert, a very few words will suffice. In those sciences, the objects of which are less complex than those of medicine, many facts are deducible in this manner with an unerring certainty. But, for obvious reasons, such inferences in medicine can seldom be relied on as facts without the support of direct evidence. The chief use, then, of inferences from general principles in medicine, is as suggestions for new inquiries. And while the most serious errors are the uniform result of regarding, as available truths, inferences of this kind without sufficient examination, nothing is better ascertained than that, under skilful management, there are no more effectual means of advancing the improvement of medical science.

EDINBURGH, 23 NELSON STREET,
February 1848.

ART. VI.—*Statistics of the Barony Parish Fever Hospital of Glasgow* in 1847–48. By JAMES PATERSON, House-Surgeon and Superintendent of the Hospital.

DURING the year 1847, fever, which had for several months of the previous year assumed, in most parts of the country, an epidemic form, prevailed so-much as to raise in the minds of all very considerable alarm.

In Glasgow, the first noted increase of the disease was in autumn 1846, from which time it became more and more prevalent, till it reached its maximum in the summer of the following year. The only public accommodation in this city, previous to 1847, was that afforded by the wards of the Royal Infirmary, and in these the number of beds scarcely exceeded 200. As might have been expected, this amount of accommodation was found, even before the close of 1846, to be insufficient, accordingly, the managers of the Infirmary rented the Lock Hospital, then recently erected, and capable of affording accommodation to seventy or eighty persons. But as this auxiliary hospital was too inconsiderable to render very efficient service in an increasing epidemic, the managers resolved that they should themselves build another on ground already in their possession; but so strong was the opposition of the neighbouring inhabitants and proprietors to this proceeding, that the design was relinquished. They then purchased a building in Bridgeton, one of the eastern suburbs of the city, but before it could be furnished to receive patients, opposition, as in the former instance, was brought forward, and in such a way as to delay the employment of the building in the manner contemplated.

Urged by the increasing demand for accommodation, and the possibility of their being obliged to quit the building they had rented, they reluctantly adopted a measure which they had previously rejected, viz., that of erecting on the Infirmary grounds a temporary shed. This was completed in June, and afforded accommodation to 140 patients. At about the same time, the Parochial Board of the City Parish, impressed with a conviction of the necessity of separating the sick from the healthy, obtained and fitted up the Old Town's Hospital for the accommodation of persons belonging to their own parish. They began to receive patients in the early part of July, and before long, their inmates numbered upwards of 600.

With a similar feeling, and for a similar purpose, the Barony parochial authorities shortly afterwards made arrangements for the erection of a temporary hospital, the results of treatment in which, the details which follow are intended to illustrate. The wooden sheds first erected contained 150 beds, but the admissions were so numerous, that a separate erection with 100 beds was soon afterwards added. The ground on which they were built was in the burgh of Anderston, one of the western suburbs of the city, and which forms part of the scattered parish, whose sick the hospital was to accommodate. There was already in existence on the spot selected, a building which had formerly been occupied as a private residence, and which, although somewhat inadequate in culinary and other arrangements to the requirements of an hospital, was found so far suitable for such purposes as to preclude the necessity of erecting any new building.

The hospital was opened for the reception of cases on the 5th of August, and in ten days it was filled. Thus, from the beginning of autumn 1847, there were no fewer than three separate hospitals in Glasgow; and in the Royal Infirmary there was extra accommodation to the number of 140 beds. The epidemic was at this time rather on the decrease, yet the number of patients in hospital, towards the close of August, and for some time subsequently, could not have averaged less than 1000. In the Barony Parish Hospital, the admissions, most numerous at its opening, decreased more or less rapidly till the middle of the present year, when the managers finding that accommodation could now be obtained as formerly in the wards of the Royal Infirmary, and having got the sanction of the Board of Supervision to the conversion of the premises into a temporary hospital for paupers and those labouring under chronic diseases, thought it unnecessary to appropriate it longer to the reception of fever cases. Accordingly, after the 20th of June no cases of fever were admitted; and by the 5th of July, or eleven months after the opening, the whole of the fever cases had been treated to a termination.

With reference to the erection of such temporary buildings during the prevalence of an epidemic, and which can be made available only while the epidemic lasts, the false economy of the measure will be at once perceived by every one who reflects on the great cost of these erections, and their generally utter uselessness after the epidemic which called them into existence has passed away. In a city of such extent as Glasgow, with a population of upwards of 350,000, we need not expect to remain long free from epidemic visitations; and although the permanent hospital accommodation already provided is amply sufficient during seasons of comparative healthfulness, its utter inadequacy during times of sickness, the past year, in common with many others, abundantly proves. What, then, can be said of the policy of remaining inactive until the tide of sickness and misery has risen with such overwhelming force as to render feeble and unavailing those efforts which, begun before its approach, might have warded off its severest shocks? However much men may differ in their views as to the best mode of preserving the sanatory condition of a large city, whether by small hospitals in each district, or by larger ones removed from the bulk of the people, there can be but one opinion regarding the propriety of effecting, by some method, the separation of the diseased from the healthy. Nothing contributes more to the spreading of any infectious epidemic than the crowding together of the healthy and the sick, even although filth and want of ventilation had no influence in its propagation. And are these influences wanting? The answer is found by ascertaining the state of the dwellings in the wynds, vennels, and almost interminable closes of the city and suburbs. In these, apartments of about eight feet by six, where ventilation is an impossibility, and where the light of heaven scarcely enters, have often to contain eight or ten individuals, of both sexes and of all ages,—more frequently, too, belonging to four or five different families than to one. Disregarding all other influences, and these are not few, one might be inclined to ask whether it be possible that, in such a place, one could become the subject of a contagious fever, and the rest escape. This is a subject which demands the highest attention of those who have control in such matters. To look at the subject only in a pecuniary point of view, what can be more opposed to the spirit of economy than, during a severe epidemic, to support at a great expense the poor in their own hovels—a system which tends directly to the increase of the disease—and, when its force has become almost spent, to erect, at a cost of some thousands of pounds, buildings which, when the rage of the disease has ceased, are all but useless? It is a subject of much satisfaction, that the parochial authorities, both of the City and Barony parishes of Glasgow, have in contemplation the erection of hospitals in connection with workhouses, and in their near vicinity, which will be at all times ready to accommodate many hundreds of patients. With such means of speedy separation from the healthy of those that become the subjects of contagious disease, future epidemics will, in all probability, be the cause of much less apprehension than hitherto.

The statistical details which follow form a summary of a series of tables constructed on the plan adopted by Dr Orr, in his statistics of the Royal Infirmary of Glasgow for 1844, 45, and 46, successively, and which were published in this Journal, vol. lxviii.

The number of patients admitted and treated to a termination during the eleven months that the building was occupied as a fever hospital, was 2639; of whom 1374 were males, and 1265 were females. Of this number, 303 died; and of these, 193 were males, and 110 were females; so that, among the former the mortality amounted to 13·93 per cent., among the latter to 8·77, and among both to 11·48. It has been already mentioned that the admissions were most numerous at the opening of the hospital, and that they became less each succeeding month. The number admitted during the first four months, (although in August the accommodation, compared with subsequent periods, was only as 2 to 3), exceeded that during all the other months by 429; and the number admitted during December and January very nearly equalled that during the succeeding five months. The mortality also varied very considerably in the different months In August it was 16·39 per cent.; in September, October, and November it averaged 7·9; in December it rose to 22·39, falling in January to 10·5; thereafter the greatest was 15·1 in March, and the lowest 7·62 in April. The difference between the mortality of the two sexes has been greater in this hospital than usually occurs. The most ordinary ratio is 11 deaths among males to 8 among females; here it has been about 13 to 8. The high mortality in December was caused by a great number of individuals, chiefly those labouring under typhus, becoming the subjects of various disorders of the respiratory organs, asthenic bronchitis, pleuritis, pneumonia, &c., which in very many instances proved fatal.

The following are the principal diseases under which the patients laboured:—

	Total Cases.	Cured.	Died.
Fever with relapse,	1145	1113	32
Typhus fever,	1370	1134	236
Common continued fever,	30	28	2
Febricula,	13	13	...
Rubeola,	3	3	...
Varicella,	2	2	...

The above list contains all the cases except 76, who were affected with other diseases, which either so much simulated fever as to have been mistaken for it by those sending the patients into the hospital, or occurred after this disease in those who had recently been inmates. Of the 303 deaths occurring among all the cases, 77 were clearly attributable to other diseases than fever, or to complications attending it, and 34 persons were moribund at admission.

Mortality,	including death from all causes, .	11·48 per cent.
Do.	excluding moribund cases, or those dying within 16 or 20 hours after admission,—34 in number, .	10·32 ...
Do.	excluding moribund cases, 34, and those dying from other diseases than fever, 77; total, 111, . .	7·54 ...

Much has been said about the impropriety of treating any but convalescent fever patients in wooden sheds, the reasons alleged for such an opinion being, that the openness and want of comfort of such buildings, render patients in the acute stage liable to suffer from various maladies which in more substantial buildings they might have escaped; but the results of treatment in this hospital, if they are not too limited to have any weight, add nothing to the support of such views. Some may fancy that the very high mortality in December, when the influences above named might be supposed to have greatest power, contradict this; but in the Royal Infirmary, the fever wards of which are remarkably comfortable, the mortality during the same month was higher than above stated by 3·31 per cent. No doubt the erections here are capable of affording a considerable degree of comfort, for the wooden walls are all doubled, and have between them a layer, many inches thick, of sawdust; yet it cannot be supposed that buildings hastily constructed of rough planks, showing occasional apertures, and furnished with rudely-made, and still more rudely-fitting, windows, should be capable of affording a near approximation to the comfort of a stone building.

The relative proportion of the two principal forms of fever varied much at different periods of the hospital's history. At its opening, the number of cases of fever with relapse doubled that of the typhus cases. At the close of the year they were nearly equal; and during and after February, the number of the typhus cases doubled that of the relapse cases. The difference between the mortality of these fevers is another interesting consideration, being 17·22 per cent. among the typhus cases, and only 2·79 among the relapse cases. A low mortality has always been a distinguishing feature in this latter disease. At its first appearance in 1843, the mortality in the Royal Infirmary was little above four per cent., and in subsequent years it was still less. At different periods of its progress it was attended by a great variety of symptoms, and some of these, at its commencement, were so rarely absent, as to have been by many considered essential. To this class belongs the jaundice, which in 1843 was so constantly present, as to give rise to some of the names by which the disease was known, such as icteric fever, mild yellow-fever, &c.; but, during the past year, icteric symptoms occurred almost as rarely as in any other form of fever. In 1843, rheumatic symptoms were very common, and, in this respect, the fever of last year differed only in being less frequently accompanied by these. In the winter months, the relapse occurred with very great regularity, happening usually on the fourteenth day from the commencement, or seven days after the first crisis, and declining pretty regularly at the termination of the third day from its acccession. But towards March it occurred less certainly and less regularly, being in many cases absent, and in others not appearing until the ninth or tenth day after the first crisis, or seventeenth from attack. A remarkable circumstance was observed in the case of a considerable number of children, viz. the occurrence of the first crisis on the sixth day from attack, and of the relapse six days later, viz. on the twelfth day, or two days earlier than usual. It was also noticed, that, in several cases of adults and youths, the first crisis happened on the tenth day, and the relapse after ten days more. This epidemic, whether it be regarded with reference to its peculiar relapse, and the changing symptoms above alluded to, or to its extremely low mortality, affords a remarkable instance of the varying forms and entirely new characteristics which disease may assume.

When an inquiry is instituted regarding the ages of the persons who have been the subjects of the two forms of fever, it is found that considerably more than one-fourth of those who have suffered from typhus, and nearly one-fourth of those who have suffered from fever with relapse, were between the ages of 20 and 30. This is not a singular occurrence, but one which statistical data of other hospitals and of other years have proved to be almost uniform. It may be in some measure accounted for by the fact, that a very large proportion of persons of this age live in lodging-houses, and are consequently the most likely to become the inmates of an hospital when seized with any contagious disease. In extending the inquiry to the mortality at the various ages, it is found that, at the earlier periods of life, excluding probably the very earliest, it is lower than at the more advanced periods, and that the ratio rises with the age.

The following is the mortality per cent., at the various ages, among the typhus cases :—

Under 10 years, .	5·66 per cent.
10 to 15, . .	7·14 ...
15 to 20, . .	11·11 ...
20 to 30, . .	15·66 ...
30 to 40, . .	21 94 ...
40 to 50, . .	28·57 ...
50 to 60, . .	46·77 ...
60 and upwards, .	38·09 ...

At the age last mentioned, the cases being only 21, they must be regarded as much too small a number from which to draw general conclusions. In the fever with relapse may be seen the same change in the mortality according to the more or less advanced age of the sufferer; but the differences, as might have been expected in so mild a disease, are not nearly so great. The number of cases of typhus in which the occurrence of complication was noted, was 109, and the chief complicating diseases were fever with relapse, bronchitis, erysipelas, dysentery, and gangrene. In the fever with relapse, the complications were forty-six, and were chiefly typhus, bronchitis, dysentery, and erysipelas. It has been already mentioned that the bronchitis occurred principally in December, and was generally of the asthenic type. The erysipelas was most prevalent at the close of last year and during the first two months of the present year, and very generally made its appearance as an erysipelatous blush on the mucous membrane of the pharynx, fauces, or mouth, gradually extending to the skin adjoining the lips, and thence to the other parts of the face and head. Sometimes it never appeared externally, the patient complaining merely of pain with some heat in the throat, which gradually subsided. A concomitant not unfrequent, was parotitis ending usually in suppuration. The number of cases where the one fever is recorded to have followed the other is only fifteen; in nine the typhus was followed by fever with relapse, and in six the reverse. The patients were indiscriminately placed in the same ward, and no attempt was ever made to classify and separate them. Hence it would seem that, at all events, for the time during which the one disease lasts, there is no likelihood of a patient becoming the subject of the other; and since, in the fifteen cases just mentioned, the residence of almost all was very much prolonged, for various reasons, it would also appear that this seeming power of resistance continues for some period after convalescence. The mortality of the complicated typhus cases was 47·7 per cent., and of the complicated relapse cases 39·1, both very high, but in the latter instance most strikingly so, seeing that over the whole of this class of cases it does not exceed 2·79 per cent. These facts show that in nearly one-fourth of the fatal typhus cases, and in one-half of the fatal relapse cases, death was caused not so much by the fever as by superadded disease.

With regard to the period of death in both the forms of fever, it is found that not much more than one-half died in what may be considered the period of active fever, *i. e.* before the termination of the twenty-first day, and that nearly one-fourth of all the deaths occurred between the tenth and fourteenth days inclusive.

Having considered these matters connected with the diseases, mortality, &c., it may be of interest to turn now to others; and first, to the consideration of the nations to which the patients belonged; and in so doing, we begin to tread upon ground which has afforded room on many occasions for much ebullition of feeling.

The numbers from each country are the following:—

Scotch, . . .	1301
Irish, . . .	1293
English, . . .	36
Foreigners, . .	5
Unascertained, . . .	4
	2639

Thus, only 49·29 per cent were natives of Scotland, while so many as 48·99 per cent. were natives of Ireland, notwithstanding that a very large number of children born in Scotland, but of Irish parents who have no claim to parochial relief, has been added to the list of Scotch. Of those treated in the other two hospitals of this city, the proportion is higher by, in the one case 10 per cent., and in the other 11 per cent. Now, on instituting an inquiry into the proportion of this large number in which parochial relief has been legally due, it is found that, excluding 158 from whom no account could be obtained, no more than 10 per cent. had been so long in the city as to have acquired a parochial settlement; in other words, 39 per cent. were supported during fever without having been entitled to relief. But the proportion must be actually higher; for it is well known that the poor, from interested motives, state their residence in town as having been more than five years, while it may have been less; and, further, although they have been longer than this period in town, they may not have acquired a settlement in any parish by their frequent removals from one to another.

To say that one-half of all the sums expended on hospital support during the past year has gone to provide for the wants of strangers, is to understate the truth.

The next subject to engage our attention is, to inquire into the relations which the number of patients brought from the various districts bear to the population of these places, and to the habits and state of the people; and such an examination may be expected to place in a clear light the causes which influence the propagation of fever and other infectious diseases. The districts and the numbers from each are the following:—

Anderston,	664	Mortality per cent.,	11·74	11·48
Bridgetown and Mile End,	446		13·	
Calton,	775		11·48	
Other districts,	754		10·34	

The disease does not seem to have prevailed more in one district than in another, as the relation existing between the population of the above places is much the same as that between the numbers of patients brought from them. The disparity appears chiefly when the numbers from the different streets of the same district are compared. In Anderston more than one-half come from three or four streets, and although these are densely-peopled, the proportion of patients to population is very much greater than in the other streets. Further, although none of the inhabitants, generally speaking, are in such circumstances as to afford to pay for medical attendance at their own houses, a considerably larger proportion has been derived from the back dwellings of the closes than from the larger habitations of the front lands. The streets themselves are not very filthy, nor are they ill-ventilated; indeed all of them in the latter respect are privileged beyond many in otherwise more favoured localities, but of the hovels in many of the back buildings words could scarcely convey a description. In Bridgeton and Mile-end the streets are almost all wide and well-ventilated, but here and there, as in other parts of the city and suburbs, are to be found the same pestilential hot-beds of disease. In Dalmarnock Road and Main Street, Bridgeton, there are a few places from which almost all of the cases—200 in number—from these two streets have been brought. Of Calton a similar account may be given, with this difference, that, whereas the streets in Anderston and Bridgeton are open, those in Calton are narrow, and shut in by buildings, so as to be in many places as much deprived of ventilation as can well be imagined. Add to this that filth is more common, and that the crowding together of human beings is still more general than in most other places. It will not, therefore, be surprising that many of the streets in this suburb should stand pre-eminent as examples of the influence of overcrowding and filth in propagating disease.

Such being the state of matters, what seems the best course to follow in order to diminish, as much as possible, the evil?

The first object which demands attention in a proposal to remedy any evil, is to remove its cause; and that, in the present instance, the cause is chiefly what has been above mentioned, few will be disposed to doubt. A very large proportion of the poor supported by the parishes, live in lodging-houses, in each of which, probably, ten or a dozen are boarded for a small monthly sum for each person. Here, then, is one of the first and most important elements of the evil we are speaking of. The keeper of the house, in endeavouring to make as much profit out of the business as she possibly can, huddles a large number of individuals into a hovel hardly fit for human beings, and provides them with food the cheapest—which is generally the worst—that can be procured. She has no interest whatever in attending to the comfort of her boarders, as she receives their board-wages directly from the parochial authorities, and consequently puts herself to little trouble in the maintenance of cleanliness. But great as this evil is, there is another which is not much less so. Every year thousands of the poor Irish flock into Glasgow, for the purpose of obtaining employment; and whether they obtain it or not, they are forced to betake themselves for shelter to the houses in the wynds, &c., and thus increase to an alarming extent an evil which already existed in too great a degree; for they do not merely add to the crowding, but, since they much more readily than others become seized with any disease which may be prevalent at the time, they also contribute more to its propagation. This is the reason why so many Irish have been treated in our hospitals; and until full and efficient measures be put in operation by our civic and parochial authorities, the evil cannot be expected to diminish. When an epidemic is rising, a great outcry is usually made about fumigation, whitewashing with lime, and a great many other supposed active measures, but comparatively little attention is given to those matters about which chiefly the greatest solicitude should be shown. Let the crowds of inhabitants be scattered, let work-houses accommodate those who can do nothing for their own support, and then, but not till then, let there be preparations made for disinfecting the dwellings. Such steps seem a mockery when employed in a state of matters like that which at present exists. If, in connection with work-houses, there be hospitals which can at any time receive patients labouring under contagious disease, one of the most powerful influences in its propagation is removed. Hence, though to erect several hospitals seems a weighty matter, yet, such a measure, the experience of many years has proved, would be the most economical of any that could be adopted. In matters of this kind, half measures have invariably ended in disappointment.

ART. VII.—*On the State of the Blood and Muscles in Animals killed by Hunting and by Fighting.* By GEORGE GULLIVER, F. R S., Surgeon in the Royal Regiment of Horse Guards.*

IT is well known that Mr Hunter's leading proofs of the life of the blood were founded on the phenomena connected with its spontaneous coagulation, and that he believed that this property of the blood, as well as the contractility of muscle, are destroyed in animals killed by hunting and by electricity or lightning. His views are particularly set forth in the first chapter of his celebrated "Treatise on the Blood, Inflammation, and Gun-shot Wounds."

After stating that "the coagulation of the blood, when out of the circulation, would appear to be unconnected with life," he says, "Coagulation I conceive to be an operation of life, and I imagine it to proceed exactly upon the same principle as union by the first intention."† In relating his experiments on the freezing of blood, of rabbits' ears, cocks' wattles, and of muscles from the frog and bullock, he remarks, "Finding the freezing both the solids and the blood did not destroy the life in either, nor the future actions depending on organization, and that it also did not prevent the blood from recovering its fluidity, I conceived the life of every part of the body to be similar; what will affect, therefore, the life of any one part, will affect also that of another, though probably not in an equal degree; for in these experiments the blood was under the same circumstances with the solids and it retained its life; that is to say, when the solids and blood were frozen, and afterwards thawed, they were both capable of carrying on their functions." Commenting on muscle retaining its power of contraction after having been frozen and thawed, he says, "Here, then, were the juices of muscles frozen, so as to prevent all power of contraction in their fibres, without destroying their life; for, when thawed, they showed the same life which they had before: this is exactly similar to the freezing of blood too fast for its coagulation, which, when thawed, does afterwards coagulate, as it depends in each on the life of the part not being destroyed."

He afterwards continues, "As the coagulation of the blood appears to be that process which may be compared with the action of life in the solids, we shall examine this property a little further, and see if this power of coagulation can be destroyed: if it can, we shall next inquire if, by the same means, life is destroyed in the solids, and if the phenomena are nearly the same in both. The prevention of coagulation may be effected by electricity, and often is by lightning."*

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* Read at the Royal Medical and Chirurgical Society, June 13, 1848.

† In my experiments, published in the 21st volume of the Medico-Chirurgical Transactions, it was found that a portion of bone which had been dead for years may yet be united by new osseous matter to living bone.

"Animals killed by lightning, and also by electricity, have not their muscles contracted: this arises from death being instantaneously produced in the muscles, which therefore cannot be affected by any stimulus, nor consequently by the stimulus of death. In such cases the blood does not coagulate. Animals that are run very hard, and killed in such a state, or, what produces a greater effect, are run to death, have neither their muscles contracted nor their blood coagulated; and in both respects the effect is in proportion to the cause."

"I had two deer run till they dropped down and died; in neither did I find the muscles contracted nor the blood coagulated."

I have thus quoted Mr Hunter's words rather fully, because his authority on these matters has had great weight in the British schools. Physiologists will probably consider that recent discoveries, among which may be noticed those relating to the structure and functions of cells, afford good evidence of the truth of the ancient doctrine of the life of the blood, whatever may be the fate of any of the experiments and observations by which Mr Hunter endeavoured to support and extend that doctrine.

I have elsewhere† remarked, that, if we admit the coagulation of the blood to be a proof of its vitality, we must also admit that the serum has life, since a mixture of two varieties of this fluid will coagulate spontaneously; that we can pickle the life, for blood kept fluid in salt for more than a year will coagulate when diluted with water; and finally, that further research is required concerning the causes which are commonly stated, on the authority of Mr Hunter, to destroy the self-coagulating power of blood and the contractility of muscle. The following observations are intended as a contribution towards this inquiry:—

Animals killed by Hunting.

Obs. 1.—The following extract is from my correspondent's note to me at Windsor:—"*Scriven Park, Knaresborough, March* 4, 1848.—I send you, in a basket by railway, a thing you have long wanted, which is the heart of a hare fairly run down to-day by the harriers, in nearly two hours from the time of finding her, and going all the time. Just before we killed, I rode quickly up to save her from getting mauled by the dogs. Bearing in mind your question about the stiffening, I remarked that this hare became as stiff as a brick-bat in a few minutes after she was dead, just as I have before told you is regularly the case in foxes and hares killed by hard running."

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* In Note xii. to my edition of Hewson's Works, printed for the Sydenham Society, London, 1846, cases are cited of coagulation of the blood, and of irritability and rigidity of the muscles, after death from lightning and electricity. Dr Sharpey informs me that he observed coagulated blood in pigeons killed by the electric shock. And since this paper was read, the same eminent teacher has placed at my disposal an interesting letter by Mr Thomson of Brighton, for which see p. 4 of the present Number.

† Note to Hewson's Works, above cited.

I received the heart and lungs together late on the night of the sixth, and examined them early on the morning of the seventh of March. The weather was cool, and the parts quite free from any putrid taint. The heart was hard and contracted; its cavities contained only a few shreds of coagulated blood entangled in the walls of the right ventricle and left auricle. The mass of the blood, no doubt, had escaped while fluid, when the parts were cut out immediately after death. The little clots of blood which remained were perfectly distinct; they weighed altogether, after having been pressed between blotting-paper, two grains and a-half; and the fibrils of the fibrin were plainly visible with the aid of the microscope, especially after the colouring matter had been removed as much as possible by washing with water.

Obs. 2.—*Windsor*, *March* 16, 1848.—A hare, trapped the day before, was turned out before beagles, and run for about an hour, when she was quite done up, unable to go any longer, and killed. The heart and lungs were cut out as soon as a string could be tied around their root, and wrapped up in a piece of dry bladder. I examined them the next day, when they were quite fresh. There were several clots of blood in both ventricles and in the pulmonary vessels. In the right ventricle, two of the clots were nearly as big as horse-beans, and rather soft. The clots in the left ventricle and lungs were much smaller and tougher. The fibrin was found to present its usual characters under the microscope. The muscular substance of the heart was hard and rigid.

Obs. 3.—*April* 14, 1848.—A stag (*cervus elaphus*), never before hunted, was uncarted at Maidenhead Thicket, and the hounds put on as usual. Being hard pressed, he crossed the Thames, between Bray and Maidenhead, went away by Taplow and Hitcham to Dropmore, where he got into the enclosure before Lady Grenville's house, and was chased by some footmen. In about ten minutes, the hounds came up, drove him out below Hedsor, thence up to near Woodlands and on to Holtspur, where he was completely beat, and dropped down dead as he attempted to jump a hurdle. He was fairly hunted to death, and the run lasted altogether nearly an hour and a-half.

In less than five minutes afterwards, his throat was cut, and about half a pint of blood received into a pint bottle, which was brought from Holtspur to Windsor in the pocket of a person on horseback. The heart was also brought and put away with the blood in a cool place.

On the 16th of March, when I first saw the blood, there were some clots in it; and when carefully examined on the morning of the 17th, not quite three days after the death, there was no sign of putridity. About a third of the blood was in shapeless and rather soft clots, some of them as big as a walnut, one of them larger and many smaller. The fibrin was observed to have the usual microscopic characters. The heart was hard, contracted, and empty of blood, except a few toughish shreds adhering to the inner part of the right ventricle. I did not see the carcass of the animal. But some time ago I submitted the following question to the very experienced huntsman of Her Majesty's hounds:—"When a deer is run to death by dogs, do the limbs become stiff afterwards, as after ordinary death, or do they never stiffen?" To which he replied, "In this case the limbs quickly become stiff;" and I have received information to the same effect from some other observing stag-hunters.

Cocks killed by Fighting.

In the inquiry concerning the effects of violent muscular exertion on the blood and muscles, it appeared interesting to ascertain their condition in animals killed by fighting; and, as I could find no observations on this subject in the books of physiology, I took an opportunity of being present at a main of cocks, fought on the 12th of June 1847, a few miles north of London.

According to custom, the birds had been fed and trained; and they were trimmed, weighed, heeled, matched and fought in pairs. Sometimes one bird was quickly killed; often the fight would last about fifteen or twenty minutes, when the combatants were exhausted to the last degree, and one of them would lie down, most frequently covered with wounds, now and then wounded but slightly, and lastly, making a desperate effort to fly at his adversary, drop down dead.

Three of these birds I dissected within an hour afterwards. There was a quantity of coagulated blood in the heart of each, and some fluid blood which coagulated after a few minutes' exposure to the air. There were some clots in the abdominal veins of one of these fowls, and some fluid blood which, in every instance, coagulated quickly when exposed to the air in a watch glass. The hearts were all rigid. The limbs and necks were very stiff; and this was the case in seventeen of the birds, being the number examined, at periods varying from one to four hours after death in or by the combat. Some of the birds disabled by wounds, were killed by wringing their necks. In one cock, struck dead by the spur through the head, when extremely exhausted in a fight which lasted twenty-four minutes, there was stiffening of the limbs, and coagulated blood in the heart within twenty-eight minutes after the fatal wound was given.

ART. VIII.—*An Account of the Epidemic Fever of* 1847–48, *more especially as deduced from the Statistical Records of the Extra Accommodation of the Royal Infirmary; with a Suggestion and Plan for Improved and more Economical Temporary Erections for future occasions.* By ROBERT PATERSON, M. D., F. R. C. P. E., one of the Physicians to the Royal Infirmary, and to the Leith Dispensary, Humane Society, and Casualty Hospital.

THE city of Edinburgh and neighbouring town of Leith furnished the majority of the cases which came under our observation in the Royal Infirmary; but numerous cases were also admitted from all quarters within fifty miles around Edinburgh, and more especially from the lines of railway at the time in the course of formation in the neighbourhood.

The epidemic presented three types of fever: the short or relapsing fever bore the highest proportion, typhus next, and synochus or continued fever the lowest.

The short fever which relapses, and which constituted the majority of the cases seen in my wards of the Infirmary, in general commenced abruptly. The patient was suddenly seized with a sense of debility, often of sickness, perhaps vomiting, general soreness, chilliness occasionally amounting to rigors; these symptoms, however, soon passing off (often in a few hours), gave rise to heat of surface, most commonly to an intense degree, to a generally very rapid, often hard, and occasionally a full and bounding pulse, varying from 120 to 160; to headach, chiefly frontal, and accompanied with much throbbing of the temples. The whole person was uneasy and restless, and general pains of the limbs were complained of. The tongue was generally covered with a white fur dry in the centre; sometimes it was quite clean, with a brownish-coloured dry stripe down the middle of it, while, in other cases, it was furred and parched throughout. Thirst was generally much complained of, along with tenderness upon pressure at the epigastrium, and feeling of tightness, which the patients themselves attributed to the quantity of water they had drank. To restlessness, sleeplessness was in general superadded, and a very common inquiry of the patients, was something to make them sleep and ease their pains.

The mind was in general tranquil, but, in some few cases, there was a tendency to incoherent talking, especially about the third, fourth, or fifth day, when, not unfrequently, considerable delirium occurred, before the critical evacuation took place. After a period of longer or shorter duration, generally upon the fifth, or from five to seven days, during which time the patient has been lying in a state much the same as described, he begins to experience a gradual remission of his sufferings. The skin becomes by degrees moister, until it is covered with copious perspiration. This diaphoresis is in general critical; sometimes it is ushered in by a severe rigor, while, at other times, it comes on more suddenly. It continues for a time most abundant, bedewing the face and hands with large drops of moisture, and saturating the bed-clothes, after which the patient feels quite relieved. The most common duration of this diaphoretic crisis is from three to six hours, sometimes much longer. I have seen it in some cases continue for upwards of forty-eight hours. Another manner in which this disease terminates, is, after an imperfect attempt at diaphoresis, the febrile symptoms become shortly renewed, and it passes on to synochus or typhus. I have elsewhere remarks to make upon the eruptions which have occurred during this epidemic. I may here mention that petechial spots, often with central puncta, were frequent during this short disease, but were not noticed in the relapses which followed. The pulse, on the occurrence of this critical diaphoresis, undergoes a remarkable reduction—from 140 to 160; it sometimes falls in a few hours to 45; in two cases it fell as low as 40, and 50 is a very common number. Along with this reduction of the pulse, the heat of skin vanishes, and it is soon left in a natural state. The critical evacuation has generally been by perspiration; but we have had cases in which it proved critical by epistaxis, by diuresis, by diarrhœa, and by menorrhagia.

This evacuation in general leaves the patient much exhausted, sometimes to such a dangerous degree as to prove fatal. After recovering from this evacuation, however, he feels himself perfectly well; his appetite returns, his skin and pulse are natural, and he is soon able to get out of bed and go about the ward. This state of matters rarely continues for any length of time; in one or two instances, a gradual recovery of strength and perfect convalescence followed; but, in the great bulk of the cases, after a longer or shorter period of good health, a slight rigor or chilliness, followed by loss of appetite, heat of skin, quick pulse, and general soreness, denoted a relapse of the disease. This relapse, in the majority of the cases, occurred on the fourteenth day from the first seizure, and terminated in a similar way generally upon the third day from the commencement of the relapse. A second and even third relapse occurred in a small number of instances.

Considerable difference of opinion seems to exist about the nature of this disease. It is clearly distinct from typhus. It is equally distinct from continued fever. But is it synocha? It may be said to answer strikingly to the description given of synocha or ardent fever by Dr Cullen; and a disease obviously very similar to that I have just detailed has been described by Dr Christison,[*] drawn, as he states, from the epidemic of 1817–20, and 1826–29, as it prevailed in Edinburgh. A modification of, if not the same disease, with more or less biliary or gastro-biliary derangement, took place in the year 1843–44, the nature of which gave rise at the time to much discussion.

It appears to me, that too little importance has been assigned to the relapses in this disease; they have been put down as accidental, or as only casual occurrences. But it ought to be borne in mind that these relapses occur in almost every case of the disease (the non-occurrence being the exception), and with a regularity, too, equal to that of any form of intermittent. It must be remembered, also, that although the early stage of the disease answers the description of Cullen's synocha (and that such a disease exists I cannot doubt), yet that it essentially consists of an attack ushered in by chilliness and rigors, followed by ardent fever, and terminated by copious diaphoresis, that this state of matters returns, like an intermittent, after a similar fashion, on a certain regular day, and is liable to recur repeatedly, but always following the same course of chills, hot and sweating stages, the constitution being able to throw off the disease after a time. It seems to me, therefore, that a disease with symptoms of this kind cannot be put down as synocha, nor as yellow fever, nor as the suette or sweating fever of Normandy; it possesses characters distinct from them all, and these lie in the regular periodicity of its intermissions. It nevertheless seems doubtful whether it can be regarded as a new disease. I think that there can be no doubt, in looking into the history of Irish epidemics, that a disease of a precisely similar description occurred there so early as 1731.

In 1731, it appears, by Drs Barker and Cheyne's account, that the epidemic of that year was of the same character as that of 1741.

In 1741, says Rutty, "there was frequently a fever without malignity of six or seven days' duration, terminating in a critical sweat, in which the patients were subject to a relapse, even to a third or fourth time, and yet recovered." "I was assured of 70 of the poorer sort at the same time in this fever, abandoned to the use of whey and God's good providence, who all recovered."—P. 75.

The epidemic of 1800–1 generally terminated on the fifth or seventh day by perspiration, and was then very liable to recur.

In 1817–18, according to Drs Barker and Cheyne, the epidemic was the same as that of 1801, and the proportion which the one set of cases bore to the other may be drawn from the records of the Royal Hibernian Military School in the Phœnix Park. In a population of 726 persons, 21 had short or inflammatory fever, 14 had typhus, and 34 simple continued fever.

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[*] Tweedie's Practical Medicine, Vol. i. p. 128.

Dr O'Brien has given a record of the epidemic fever of 1826–27. He says it presented two forms of fever, which he distinguishes into that of the old and new constitution. The old was the ordinary typhus, proceeding to the 11th, 14th, 17th, or 21st days. The second variety, or new constitution, which was predominant, was distinguished chiefly by short periods, terminating in three, five, seven, or nine days,—the five-day period being the most common, generally by copious sweating. In this comparatively mild form of disease, the most perplexing circumstance was the frequency of relapses.*

This form of fever seems to constitute a new link in the Cullenian division. It has a certain amount of the intermittent and a certain amount of the continued fever in its composition, and yet it neither can be called ague, on the one hand, nor synocha, on the other. It has been well named, from its most prominent characters, *short or relapsing fever*.

Synochus and typhus may now be considered as endemial to these countries, and most probably to most large towns on the continent of Europe. In Great Britain the endemic constitution seems to have sprung up since the commencement of the present century. The first notice which I can find in reference to the introduction of fever into Edinburgh and Leith is recorded by Dr Hamilton in his work on purgative medicines. In the summer of 1779, a typhous fever of more malignity than usual appeared in Edinburgh. It originated in the hospital appropriated to the sick prisoners of war who were then confined in the Castle. Every precaution was used, without effect, to prevent the spread of the contagion. Many of the soldiers of the garrison and inhabitants were seized with it.

In the summer of 1781, a fleet of merchantmen arrived in Leith Roads from Jamaica. The passage had been tedious, the crews were sickly, and they had been for some time on short allowance of provisions. Nevertheless they had been obliged, by the circumstances of war, to avoid the British channel, and to come round by the north of Scotland. From the beginning of July to the 9th day of August, 126 men were sent on shore with fever from one of H. M. ships of the convoy. Of these, 23 died; and of 40 men who were landed from the Egmont, another of the convoy, 8 died. Such of the sick as could not be accommodated in a temporary hospital were quartered in Leith, two, three, or four being billeted in one house. Many of the inhabitants were seized with a fever of the same kind as that which affected the seamen, and it prevailed for some time afterwards. This fever was similar to its predecessor.

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* Report of the House of Recovery and Fever Hospital of Dublin for the year ending 1827. By Dr John O'Brien.

Typhus fever seems again to have prevailed in 1798–9, and again in 1806–7.

Dr Orr of Glasgow has drawn attention to the recent and regular recurrence of fever in an epidemic form in Glasgow every ten years; and it is almost demonstrated that his estimate of their regularity of return is not far from the truth. It is to be lamented, that during the latter part of the last century and the beginning of the present, so little was written on the subject of epidemic visitations of fever. Indeed, we have reason to believe, that epidemics passed over without any record being left of their extent or character. So far, however, as I have been able to obtain information, this periodicity in the recurrence of epidemic fever seems to be maintained elsewhere as in Glasgow. The following table shows the years in which we have records of its occurring in

Ireland,	Edinburgh, and	Glasgow.
YEARS.	YEARS.	YEARS.
1708, 1709	1778, 79	1817, 18, 19
1718, 19, 20	1781, 82	1826, 27, 28
1728, 29, 30	1798	1836, 37, 38
1739, 40, 41	1806, 1807	1846, 47, 48[*]
1762	1816, 17	
1798, 99	1826, 27, 28	
1803	1836, 37	
1807, 1808	1843, 44	
1817, 18	1846, 47, 48	
1826, 27, 28		
1836, 37, 38		
1846, 47		

During more than half a century, therefore, it seems to have exhibited the tendency to recur periodically; and the history of these often favour the idea of its having been a disease imported into this country.

There can be no doubt, however, that since the beginning of this century, those who have been conversant with the diseases of the masses, have observed at all times more or less typhus or continued fever amongst them; and the records of the Infirmary show that there have been at all seasons more or less of this disease in the wards of this charity. It was customary for a time to attribute the increase of fever, which usually occurred during the autumn and winter months, to importation with the Irish reapers;[*] but, in truth, the same disease was in existence before the Irish came over, and was probably at the time increased by having individuals exposed to its contagious influence, with their constitutions in a state which predisposed them to take it, or that the particular season of the year tended to its increase. In short, it is obvious that these types of fever, whether engendered or imported, had become endemic from that period in most of the larger towns in these islands. They linger in certain filthy ill-ventilated localities; and when an epidemic constitution is engendered, the cases do not occur scattered or unconnected with one another, but beginning in these haunts, increasing by slow degrees, from one member of a family to another, from family to family, from house to house, from stair to stair, according to proximity or intercourse, until the population is widely and promiscuously affected.

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[*] The interval between the epidemics may be said to be from five to eight years, which gives a period of from three to four years for an epidemic to exhaust itself.

Epidemic diseases introduced from other quarters most commonly present certain peculiarities which appertain to the fevers of the country from which they are imported; and it appears to me, from evidence which I shall presently adduce, that this peculiarity was a prominent feature in the epidemic disease of which we are about to speak.

The amount of fever which constantly exists in the town of Edinburgh and suburbs will be best shown from the admissions into the Royal Infirmary during a period not marked by any epidemic, or any unusual prevalence of the disease.

Thus, the admissions into the Royal Infirmary of fever patients during the respective months of the years 1844, 45, 46, 47, were as follows:—

1844-45.		1845-46.		1846-47.	
1844	No.	1845	No.	1846	No.
November .	89	November	79	November .	61
December .	55	December .	69	December	74
1845		1846		1847	
January	51	January	64	January .	66
February .	49	February .	35	February .	83
March .	32	March .	47	March .	175
April . .	23	April .	29	April .	274
May .	25	May .	33	May .	235
June . .	35	June .	29	June . .	752
July .	35	July . .	26	July .	751
August .	19	August .	49	August .	679
September .	9	September	28	September	228

From the above table, it is obvious that, during the winter months of 1846-47, no increase of febrile disease more than usual occurred in Edinburgh.

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[*] It has been long remarked, that in those towns which have much intercourse with Ireland, as Liverpool, Manchester, Bristol, Glasgow, fever predominates more than in others not similarly circumstanced; and Dr Lombard argued, that it was imported by Irish labourers who go over in great numbers to reap the harvest.

The failure in the potato crop of the summer 1846, although widely and severely felt, did not give rise to so much suffering in Edinburgh and the surrounding country as it did elsewhere. The wages of the working classes were remarkably high, employment abundant, which enabled them by other means, and by using articles of food not quite so wholesome or nutritious as usual, to avoid want and disease, and to subsist with their high wages and abundant employment in a state of health nearly equal to that which they were enabled to enjoy when provisions were abundant, but employment scarcer, and wages less.

Although from the want of this wholesome farinaceous root, scurvy and other diseases were abundantly engendered, yet fever seems to have been averted; and it was not till the month of February, or rather the beginning of March 1847, that a decided increase in the admissions to the Infirmary took place, as well as a change in the general character of the fever itself. The endemic fever, as I have already stated, is synochus and typhus; and such was the character of the disease which prevailed up till February 1847,* at which time the epidemic may be said to have commenced. In this month, cases of relapsing fever became common. This disease, we shall find, was, during the autumn and winter months of 1846–47, prevailing extensively in Ireland. In Glasgow it began, according to Dr Orr, a month or two sooner than in Edinburgh, and all presented the same characters. Was the disease an imported one, then, or did it arise from the same causes in different places? To come to a proper understanding of this question, it is necessary very shortly to trace the origin and progress of the epidemic in Ireland.

I have already mentioned the endemic febrile constitution which has been engendered in this country since the commencement of the present century. This endemic constitution seems to have existed for a long series of years, and to a much greater degree in Ireland than in this country or England. From some statistical data, published by Mr Wylde, of the mortality of the province of Leinster for ten years, ending in 1841, a period not marked by any remarkable epidemic visitation, the deaths from fever alone amounted to one-tenth of the whole mortality.† In

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* I believe that a few isolated cases of relapsing fever were seen in the hospital towards the end of the year 1846, but they were so few as hardly to be worthy of mention.

† The continuation of fever would seem to have been noted in the beginning of the last century, as we find Rogers asserting of the different epidemics of 1708–9, 1718–19, 1728–29, that they were not successions of different fevers, but the same disease which had been never extinguished, but which circumstances had called into operation, according as alterations of the seasons or privations occurred?"

Dublin, the average mortality from fever is one twenty-fifth of the whole mortality. We have no statistical data to which we can refer in Edinburgh; but in London, the average mortality from fever is only half what it is in Dublin, viz. one-fiftieth to the whole mortality. In Edinburgh, I should think that the average mortality from fever, as compared to the mortality generally, must be higher than that of London. The immense number of cases that are sent from all quarters to Edinburgh for hospital relief, and many of them of the worst kind, must of consequence materially increase the number of deaths from this cause; but if we take the large towns of Scotland generally, I am satisfied that the average of these will not exceed that of London. The failure of the potato crop of the summer 1846 was more severely felt by the people in Ireland than in any other country in which this root became blighted. The food of by far the greater number of its inhabitants in ordinary years is almost entirely composed of potatoes. The sudden and unexpected failure of a crop which promised so well, completely paralyzed them in making provision for a supply of food in any other way. In spite of every effort that was made by the government, and the benevolent and affluent of the country itself, the depraved quality and deficient supply of food soon began to tell upon their constitutions. Masses of them became in this way predisposed for receiving the contagion of a disease so extensively endemial amongst them; and when we consider the immense number of poor in that country, the filthy habits of these, both in their persons and dwellings; the numbers that gather together in one little dirty cabin or hut; the custom of numbers flocking into the sick rooms and sitting by the patients; and the still more obnoxious ceremony of the "wake," or sitting for hours or whole nights in the same room with the dead body,—it need be no cause of wonder that the disease spread with a rapidity almost unparalleled. Scenes of misery were recorded by the daily press of the most harrowing description. Whole families were swept away, and, in some districts, so great was the mortality, that it was difficult to get them buried. In addition to the other assistance which the government afforded, they supplied the means of emigration to other countries; but the disease followed them on board the ships; and so universally fatal was fever on board these emigrant vessels, that few escaped the disease, and of those affected, more than a half are said to have perished. While the

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And the constant occurrence of fever throughout Ireland is very distinctly stated in a very excellent paper by Drs Cusack and Stokes, on the Mortality of Irish Medical Practitioners. "The medical practitioners of Great Britain," say they, "have only to contend with infectious fever occasionally, and rarely, indeed, in the rural districts. The Irish physician has to combat it in all situations and at all seasons."—Dublin Journal, Vol. iv. 1847. P. 139.

government provided the means for their emigration to distant countries, many resolved at once to turn anything they possessed into money, to enable them to leave the country when disease and death was decimating their numbers. The numerous packets which ply between this country and Ireland, the cheapness of the passage-money, the prospect of employment and good wages, all combined in bringing them over to the nearest ports in immense numbers. Liverpool and Glasgow suffered principally. They began to arrive there early in the winter season,—shortly, indeed, after the effects of the famine began to be felt; and to so great a height did this emigration reach, many of them actually labouring under the disease at the time, that government had at last to interfere and put a medical survey on all the vessels arriving from Ireland with passengers, and a quarantine, if fever was found on board. This had the effect of diminishing the numbers of those coming over, and also of making the owners and officers of the packets more particular in their examination of those presenting themselves as passengers. I cannot but think that, had such means been adopted earlier, we would have had less of the disease in this country. Dr Orr allows "that the Irish paupers who, during the past year, have flocked in such numbers to Edinburgh and Glasgow, have been the principal victims of the disease, and that it is owing to their great influx and destitution that the epidemic attained such a degree of prevalence."—P. 373–4.

The mischief, however had been already effected. These poor people, wretchedly clothed, exposed to cold and wet as deck passengers, many of them starving, and not a few of them actually labouring under disease, were ushered into our densely-populated towns, there to seek the cheapest and most wretched lodging-houses or places of shelter. Fever thus became introduced into these abodes, and after its introduction it was kept up by a system as loathsome as culpable, until the authorities, in many instances, interfered for its removal. It was impossible to put it down, however; as, whenever they had their houses whitewashed and cleansed and their bed-clothes washed at the public expense, they resumed the same system. I had several opportunities of visiting these lodging-houses occupied by the poor Irish. They in general consist of large-sized rooms, in dirty and badly-aired localities (generally the poorest in the town), in which beds are arranged on the floor as thickly as they could be placed. Here all sexes and ages occupied; and when one took fever and was removed to the hospital, no cleansing took place, but the next applicant was admitted into the bed just vacated by the fever patient. In this way the disease was spread, and, as may be easily imagined, every bed in a lodging-house of this kind soon became a focus of contagion. One little wretched smoky cabin which I had occasion to visit, furnished to the Infirmary five cases out of one bed in the course of three weeks.

Dr Orr has not mentioned in his valuable paper on the epidemic as it appeared in Glasgow, whether the first patients offering themselves for admission into the hospitals there, were Irish. It would have been interesting to have been furnished with this fact. In Edinburgh almost every case admitted into the Infirmary at the beginning of the epidemic was from Ireland; and for nearly three months they continued so. A record was taken, on the 10th of June 1847, of the number of fever cases in the Infirmary, and the countries to which they belonged, the result of which was,—

Fever Cases, 473. Scotch, 87. Irish, 379. English, 7.

And again, on the 26th of July 1847, the record was as follows:

	English.	Scotch.	Irish.	Foreigners.	Total.
Fever,............	10	186	410	2	608
Medical,.........	3	54	39	0	96
Surgical,.........	2	72	23	0	97
Total,............	15	312	472	2	801

Dr Orr has made a very similar remark of the patients treated in Glasgow, the average throughout the whole epidemic being 60 per cent. of Irish to 40 of Scotch.—Page 376.

I shall shortly recapitulate the circumstances which I think lead to the belief that the disease which has lately devastated our city had its origin in Ireland, and was imported into this country by means of Irish immigration.

Firstly.—The history of the fever shows its having been long known in Ireland.

Secondly.—Its history proves that it was prevailing extensively in Ireland before it was seen in this country.

Thirdly.—Many early Irish emigrants to this country were known to be affected with fever.

Fourthly.—The towns to which they had easiest access, and where they arrived in greatest numbers, were those in which it first began to prevail.

Fifthly.—The parts of those towns in which the disease first made its appearance were known to be chiefly occupied by Irish.

Sixthly.—The first cases which occurred in hospital practice were all Irish.

Seventhly.—The Irish constituted more than a majority of the patients affected with fever throughout the whole epidemic.

In Glasgow they amounted to 60 per cent.

In Edinburgh they amounted to 73 per cent.

Eighthly.—In Edinburgh, the first cases either came direct from Ireland into the Infirmary, or from lodging-houses solely inhabited by Irish who had recently came over.

And, *Ninthly.*—The evidence of this must have been sufficiently convincing to those whom the government appointed to inquire into the state of this immigration into this country, when a medical inspection was established upon vessels carrying passengers between the Irish ports and this country, and a quarantine if fever was found on board.

Dr Stark has adduced another argument in favour of its origin being imported contagion, in the fact, that the great majority seized with the disease were males. Of 1517 deaths from fever during 1847, 924 were males, and 593 females. If the disease had arisen spontaneously in this country, females bearing the highest proportion to the population, the result would have been otherwise. We should have had more, or at least an equal number of females; but the males bear the highest proportion, since they form the majority of immigrants.

We have not space to do more than allude to another question which forces itself into notice in the history of this epidemic, viz. the connection between famine and fever.

That bad or deficient food, along with want of cleanliness and ventilation, can engender disease, and especially fever, is a point which can hardly be disputed. The instances which are on record in which disease, and especially fever, has been thus engendered in ships, hospitals, jails, and camps, and from which circumstance different fevers have taken their distinguishing names, are too numerous to be dwelt on. In many of these instances, opportunities have occurred of watching the gradual progress of famine into disease.

The history of epidemic diseases affords us other examples in which the connexion is distinctly established.

A fever is mentioned by Carlo Galli that occurred and laid waste nearly the whole of Lombardy, towards the end of the sixteenth century. It followed upon a famine, and spread through Tuscany for four years. The famous plague of Milan, mentioned by Tadinus, was produced by thousands of beggars crowding into the city in a state of starvation. To save the population from the annoyance of so many mendicants, the government provided a neighbouring convent for them; and soon the scanty allowance of food and crowded state of the apartments produced such a pestilence or fever, that it was thought proper to allow those who were free from the disease to leave the place. They carried with them, however, the seeds of the disease, and soon whole families in the city and neighbouring villages were affected, and it devastated the place widely.

The well known dreadful epidemic fever of Naples in 1764 is distinctly referable to a similar cause, and is thus ably described by Sarconé. "The multitudes of miserable beings," says he, "wandering from city to city, presented in every part a spectacle of sorrow and desolation. The inclemency of the weather,—the scarcity and depraved nature of the provisions,—the very idea of insurmountable misery,—the natural filthiness of the wretched people,—the absolute want of means of changing their linen and clothes, which had become excessively filthy, and saturated with an offensive effluvia,—their continual wanderings and fatigue,—all could not fail to alter the state of the blood of these people, and to generate in their constitutions this fatal disorder, which is commonly the consequence of famine and misery." But let us come to look at the Irish epidemics themselves, and the light they throw on this question.

In the years 1739, 40, and 41, a severe epidemic of fever broke out throughout Ireland. It arose after a long continued and most intense frost in the winter of 1739, and a failure of the subsequent crops. It was general throughout the island, but, according to Rutty, especially devastated "the provinces of Munster, Leinster, and Ulster, but was most fatal to the first, where their poor was worse provided for."

In the years 1798, 1799, and 1800, another epidemic of fever, even more extensive than formerly, prevailed throughout Ireland. It is stated to have had its origin in the wretchedness and poverty into which the poor of the country were thrown in consequence of rebellion and failure of the crops during two successive years. "The state of the poor in the principal towns in Ireland in the years 1799, 1800, 1801, and 1802," says Drs Cheyne and Barker, "was wretched in the extreme."

Another epidemic from failure in the crops arose in 1817, 1818, and 1819, and devastated the country widely; and the still more recent epidemic of 1846–47 has added another and recent instance to those already recorded.

Drs Cheyne and Barker, writing of the epidemic of 1800, concurs in a statement which was used at the time, that "the immediate effects of want of food are weakness of body and depression of mind, causes which contribute, in an eminent degree, to the production and extension of contagious fever." In addition to this, moreover, "the poor are under the necessity of pawning their clothes for daily sustenance, which occasions increase of filth, exposure to cold, and the crowding of several members of a family in the same bed."

Indeed, the point is now so generally admitted, that, in the epidemic of 1817, 1818, and 1819, fever was anticipated in several localities as the uniform result of famine.

Again, in 1846–47, preparations were early made for the recurrence of fever, as a result of the failure of the potato crops.

The argument which has been used by Dr Graves, that, although famine is general over the island, fever only prevails epidemically over a small portion of it, is readily explained, on the gound that these parts are the very ones where masses of filthy, hungry, and half-naked wretches congregate, and who are especially liable to have fever lingering amongst them in times of plenty, far less in times of scarcity.

The idea which I have formed of the connection between fever and famine in Ireland, is somewhat different, and may be shortly stated as follows. I have already quoted from various sources the amount of fever which is endemic to Ireland, which seems never to leave certain districts of it. Indeed this need be no cause of wonder, if we for a moment consider the wretched condition of the poorer classes, their extreme poverty, their filthy habits, their wretched dwellings, and their peculiar customs. On the occasion of a failure of the most common articles of food, these poor creatures begin to suffer immediately. They have not the means to buy it when it gets high; they must therefore pawn their rags to get nourishment. In this half-clothed, half-starved condition, they become highly susceptible to the influence of fever; lingering, as it does, constantly amongst them, it thus gains new force and vigour. More are beginning to suffer day after day from hunger, and thus fresh victims are prepared for a disorder which soon assumes an epidemic form, in consequence of its finding many other victims for its malignant influence. In this way I am inclined to ascribe the action of famine more to the kindling of a spark which is constantly smouldering amongst them, than to the lighting up of a new one; at least this seems to be the explanation of the epidemics during the present century.

I have digressed a little from the regular course of my narrative, for the purpose of considering whether or not the disease we have been considering was an imported one, and arose from famine.

As the number of applicants with fever at the Royal Infirmary increased, the managers at once determined to admit as many as they could procure accommodation for; and I have no doubt that, to the promptitude with which they acted for the public welfare, is to be attributed a considerable reduction in the number and the mortality of those who ultimately became affected with the disease. They therefore, when the fever wards in the Infirmary and Fever Hospital became full, opened nine other places for their accommodation, including five tents in the green; and latterly the garrets of the Infirmary itself were cleared out for convalescents. In this manner, for a time, nearly all the cases were admitted as soon as application was made; and by this means much spreading of contagion was avoided, and many poor creatures brought from a distance were at once accommodated, to whom delay in admission even, far less a removal back to their wretched homes, would have proved fatal.* Many of those admitted from a distance died within few hours; and numbers were saved by placing them in a warm bed, surrounding them with artificial heat, and administering stimulants freely and repeatedly, until reaction was established.

The ordinary number of patients which the Infirmary accommodates, amounts to between 200 and 300; some idea, therefore, may be drawn of the amount of extra accommodation which had to be provided, when, on the 26th June 1847, 803 patients were in the house and adjoining grounds at one time, 628 of which were fever cases.

It becomes a matter of considerable interest and importance to ascertain as nearly as possible the proportion which fever cases bore to the population generally, as well as the mortality from fever to that population.

The records of the Infirmary itself cannot be expected to yield even approximative results, for, in addition to the cases sent there both from town and country, many are treated at home from the dispensaries by private practitioners, &c.; and in town, the parishes had surgeons of their own who attended the poor at their houses; and latterly, one of the parishes had a fever hospital opened for its own poor. It will be obvious, therefore, that unless we could come at the result of all these combined, we cannot arrive at a proper understanding of the numbers affected with fever.

The above remarks will appear more distinctly when I compare the mortality which the Infirmary records show, and add to it that of the City Parochial Hospitals, and those of the Leith Fever Hospital and dispensary, with that given by Dr Stark from the records of the burials.† It stands in round numbers thus:—Total fever mortality from January 1847 to July 1848, including Leith, 2503 (Stark). Total fever mortality of Edinburgh Infirmary is 1201; of Leith Fever Hospital, 37; and City Board Parochial Hospitals, 112; total, 1350.

The above results show a most important fact,—that nearly as many deaths from fever occurred out of the hospitals as within them. This fact appears the more startling when we call to recollection the great exertions that were made to accommodate all those applying for admission into the different hospitals, with the very view of preventing many of them passing through the disease at their own houses. It is so far explained, however, when we consider the rapid increase which took place in the number of the cases within a very short space of time, and the limited amount of hospital accommodation; for after the Royal Infirmary was quite full, many hundred cases applied for accommodation that could not be admitted. Although, therefore, in all epidemics, the same must take place to a certain extent, yet it is very questionable if the proportion would be so high. As it is, however, the above calculations show that as many cases of fever in the town were treated out of the hospitals as in them.

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* It is a well established fact that fever patients stand removal to any distance very ill. From an account kept, which shows this point in the epidemic of 1843 (Infirmary Report), removal from Leith, a distance of 2½ miles, increased the mortality by a half.

† Dr Stark has explained to me that, if there is any error in his fever mortality, it must be on the side of non-enumeration,—some cases of fever being possibly returned under the head of "causes of death not ascertained."

Many of the cases of fever admitted into the Infirmary came from the country. The proportion of cases of fever from the town and country, as deduced from the hospital report of 1847, gives the following results of 4084 cases. 2957 came from the town, and 1127 came from the country; being a proportion of 72·41 per cent. from town, and of 27·59 per cent. from country.

Again, a great proportion of the cases of fever were Irish who had only a temporary residence here—whose presence swell largely the fever records—but whose numbers ought to be excluded in drawing the proportions which an epidemic of fever bears to the population. The average of two trials made in the Infirmary on the 10th June 1847, and 26th July 1847, of the relative proportions of cases from the different countries gives the following result:

	Irish.	Scotch.	English.	Foreigners.
Fever cases, ·	394	136	8	1
Average proportions,	72·96	25·18	1·48	0·20

Now, if we take Dr Stark's mortality, which must be very near the truth, and apply the above calculations to it, results singularly curious, and almost conclusive, come out as to the proportion of the population of Edinburgh and Leith that were seized with and died of epidemic fever. Thus when the proportion of town and country patients, as deduced from the Infirmary records of 1847, are applied to the total fever mortality given by Dr Stark, the results would be as follows:—

Of 2503 deaths, { 1814 would be from town.
689 ... country.

If the Infirmary average of the countries which yielded the patients be correct—

Of 2803, { 1827 would be Irish.
630 ... Scotch.
38 ... English.

But if we take the proportion from the different countries which the town average yields, it is as follows:—

Of 1810, { 1325 would be Irish.
457 ... Scotch.
28 ... English.

And if, of the town mortality, the half of the Irish are excluded, as temporary lodgers, and as not coming under the head of resident population, the numbers will be of deaths from fever in the resident population of the towns of Edinburgh and Leith—

Total, 1148, being composed of
663 Irish.
457 Scotch.
28 English.

If the whole fever mortality be reckoned at 1814, it gives 1 death for every 93 of the population. But if the deductions are made which I have suggested above, of the half of the Irish from the town mortality, it gives 1148, being 1 death for each 138 of the resident population.

The difference, too, becomes greater as to the number of patients affected with fever, as calculated from data, excluding the proportion of country population and the half of the Irish town population. Thus: the number of cases of fever which the whole mortality of Edinburgh and Leith gives, including the neighbouring country, and without any deduction—

Total mortality, 2503.
Total cases of fever, calculated at 13[*] per cent., 19,254.
Proportion, 1 case of fever in every 9 of the population.

But if we exclude the proportion of country mortality, and half the Irish town mortality, the results will, in my opinion, come nearer the truth. They would stand as follows:—

Total mortality, under deductions, 1148.
Number of fever cases, calculated at 13 per cent., 8830.
Proportion to population, 1 in every 19.

The following exhibits the above results drawn out in a tabular form:—

Proportion of Fever deaths to Population.

	Numbers.	
From town mortality, deducting half the Irish,	1148	... 1 in every 138
...... alone, without deduction,	1814	... 1 ... 93
From total mortality of town and neighbouring country, . . .	2503	... 1 ... 67·50

Proportion of Fever Cases to Population.

From total mortality of town and neighbourhood,	19,254	... 1 in every 9
... mortality of town alone, under deduction of half the Irish, . . .	8830	... 1 ... 19

On the opposite page is a table drawn from the Infirmary records of the numbers that were admitted, that died, and that remained in the house at the end of each week, during the prevalence of the epidemic; and it exhibits in a singularly beautiful manner the gradual increase of the disease until it reached a certain point, and the as gradual decline of it,—a circumstance which Dr Christison and others have remarked to be constant with fever visitations in an epidemic form.

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[*] I have fixed upon 13 per cent. as the average mortality for the following reasons:—First, it is near the average mortality of males and females in the Infirmary; secondly, it is about the average of Leith Hospital, which I consider to be a good criterion to go by, as the cases were sent in early, and from no distance; and lastly, it is near the mortality which Dr Stark has fixed upon for his tables.

Dates.	Admission.	Deaths.	Remaining in Hospital.	Dates.	Admission.	Deaths.	Remaining in Hospital.
Sept. 30, 1846	...	...	55	Sept. 11, 1847	167	10	546
Oct. 5, ...	12	1	52	... 18, ...	140	19	535
... 12, ...	18	...	48	... 25, ...	...	...	527
... 19, ...	12	2	58	Oct. 2, ...	151	27	512
... 26, ...	13	4	49	... 9, ...	217	18	590
Nov. 2, ...	20	2	61	... 16, ...	125	23	577
... 9, ...	13	6	62	.. 23, ...	138	19	563
... 16, ...	13	4	50	... 30, ..	154	16	556
... 23, ...	19	2	58	Nov. 6, ...	167	18	565
... 30, ...	9	3	58	... 13, ...	150	23	547
Dec. 7, ...	17	1	56	... 20, ...	153	28	532
... 14, ...	23	3	60	... 27, ...	133	32	527
... 21, ...	23	5	62	Dec. 4, ...	136	52	506
... 28, ...	20	2	58	... 11, ...	113	45	476
Jan. 4, 1847	15	...	62	... 18, ...	132	35	476
... 11, ...	20	...	67	... 25, ...	120	19	451
... 18, ...	14	7	61	Jan. 1, 1848	99	18	444
... 25, ...	17	1	60	... 8, ...	144	12	473
Feb. 1, ...	17	2	63	... 15, ...	144	15	475
... 8, ...	22	4	70	.. 22, ...	141	21	461
... 15, ...	17	1	73	... 29, ...	127	15	486
... 22, ...	13	1	74	Feb. 5, ...	108	22	479
March 1, ...	45	2	73	... 12, ...	98	26	410
... 8, ...	45	4	98	... 19, ...	104	21	399
... 15, ...	41	1	114	... 26, ...	112	19	396
... 22, ...	50	5	121	March 4, ...	110	12	396
... 29, ...	51	6	134	... 11, ...	111	27	394
April 5, ...	52	6	144	... 18, ...	93	21	357
... 12, ...	54	7	146	... 25, ...	88	14	355
... 19, ...	64	8	174	April 1, ...	84	12	333
... 26, ...	82	14	206	... 8, ...	81	6	306
May 3, ...	76	10	230	... 15, ...	81	8	308
... 10, ...	84	15	246	... 22, ...	58	13	278
... 17, ...	102	14	279	... 29, ...	74	11	263
... 24, ...	137	16	339	May 6, ...	101	9	294
... 31, ...	131	15	383	... 13, ...	58	15	249
June 7, ...	141	22	435	... 20, ...	65	5	241
... 14, ...	108	21	508	... 27, ...	50	9	224
... 21, ...	181	26	569	June 3, ...	41	8	207
... 28, ...	201	30	602	... 10, ...	49	13	168
July 5, ...	161	24	622	... 17, ...	41	5	159
... 12, ...	159	33	628	... 24, ...	34	3	153
... 19, ...	174	25	607	July 1, ...	40	6	141
... 26, ...	182	22	597	... 8, ...	39	7	137
Aug. 2, ...	163	20	598	... 15, ...	45	6	137
... 9, ...	150	20	593	... 22, ...	26	6	119
... 16, ...	...	...	556	... 29, ...	43	5	118
... 23, ...	...	...	537	Aug. 5, ...	34	2	125
... 30, ...	...	...	539	... 12, ...	24	2	116
Sept. 4, ...	144	12	542				

The records of the epidemic in Leith may very properly be adduced in drawing an account of the numbers affected with the disease in Edinburgh. In Leith the disease was fully two months later of showing itself than in Edinburgh. A decided increase of fever took place towards the end of May or beginning of June. This may be accounted for in the same manner as we have the difference between Glasgow and Edinburgh, viz., that the Irish immigration first took place into Glasgow; when it became full of them they came direct through to Edinburgh; and when the lodging-houses there also became full, they went to Leith; and I have no doubt that, had we the records of other places whither the Irish went, and in which it appeared, we should find it appearing at an earlier or later period than Edinburgh, according as they were nearer or more distant from the sea ports in communication with Ireland. In Leith, too, the early cases were chiefly Irish, and the disease was most remarkably confined to the closes, courts, and alleys of one street, which is chiefly occupied by the poorest of the town, and where the majority of the Irish live. The Dispensary records show the gradual increase and decline which took place in the epidemic. I shall quote them from April 1847 to July 1848.

Fever cases applying at Leith Dispensary.

1847.	No.	1847.	No.	1848.	No.
April .	3	October .	66	March .	36
May .	5	November	51	April .	54
June .	21	December	43	May .	14
July .	23	1848.		June .	44
August .	45	January .	29	July .	22
September	71	February .	31		

The total number of cases which were affected with fever in Leith up to the present date may be said in round numbers to be nearly 1000. The records of the Dispensary show a total of 550 cases. There were treated in the Fever Hospital 266,* 150 of which were not previously entered in the Dispensary records, making a total of 700; but many poor and working people were treated at home by private practitioners, as well as those that suffered in the better ranks, must, I think, bring up the number affected to about 1000.

Statistics of Leith Fever Hospital, from its opening, 29th September 1847, till its close, 14th February 1848.

	Males.		Females.		Total.
Admitted,.....................	132	...	134	...	266
Dismissed Cured,............	114	...	115	...	229
Died,..........................	16	...	18	...	34
Sent to Infirmary,.........	2	...	1	...	3

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* Many of those sent to the Leith Hospital had been previously registered as Dispensary patients. From a comparison which I have made of the books, nearly a half may be said to have been registered in the Dispensary books, and afterwards sent to the Hospital.

Rate of mortality in males,......................	12 12
„ „ females, ...	13.43
Total rate of mortality,..........................	12.78[*]

The parts of the Infirmary which were placed under my superintendence was the extra accommodation which had been prepared for the emergency. These consisted—

First, Of a shed marked C.

Second, Of a shed marked E.

Third, Of five tents erected on the green, and in the open ground at the back of the Infirmary.

Fourth, These were displaced as the season advanced by a long wooden shed marked F, divided into three compartments.

In these receptacles, during the course of the epidemic, 1541 cases were admitted, of which—

639 were cases of short or relapsing fever.
539 ... ... typhus.
145 ... ... synochus.
218 ... of other acute diseases, or of cases whose names are entered but no disease attached.

Before entering upon the more minute statistical details of fever, I may state that much has been omitted in recording the different cases which would have been valuable. This arose, not from neglect on the part of the young gentlemen who acted as clerks, but from the impossibility to undertake the duties of superintending the numerous patients, far less that of keeping a due record of their cases. The number of young gentlemen who were willing to act as clerks in the fever wards was very limited; and to the three gentlemen who acted with me, Drs Aitken, Chalmers, and Rennie, I cannot bestow too high a meed of praise for the diligent discharge of their arduous duties. The want of sufficiently minute records is not their fault, but the fault of the immense mass of cases admitted, and the few individuals to look after them. The statistical records of the different places under my care will be found as follows.

Tents.—The tents were five in number, erected in the open space at the back of the Infirmary, and exposed to free currents of air. Flooring boards, one to two inches in thickness, were laid to a sufficient extent upon the grass, and over them the tent was erected. Three of these were ordinary round tents; one was an hospital military tent; while the other was a large lofty one, which contained 14 beds, the others not accommodating more than 9 or 10 each.

The first patient was admitted on the 17th of May 1847, and the last on the 22d September. The last tent was taken down the week following.

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[*] The total mortality of the Leith Hospital is less than that of Edinburgh; and this difference must arise from the short distance they have to be brought to the Hospital, and their having been sent much earlier in the disease.

Number of patients treated in tents, 312; total mortality, 17; being 5.36 per cent.

Of this number, 114 were cases of typhus, of which 14 died, being 12.39 per cent., or 1 in every 8 cases (= 1 in 8·0714.)

Of 14 deaths in typhus—

7 died of pure typhus;
1 pneumonia of right side;
1 with head affection (probably softening of brain), ending in hemiplegia;
1 with jaundice and bronchitis combined;
1 had copious diaphoresis;
1 had noma;
1 had mania, pneumonia, and gangrene of lung;
1 had infiltration of pus into anterior chamber of right eye.

Of 100 that recovered—

5 had diarrhœa;
1 had diarrhœa and epistaxis;
2 had bronchitis;
2 had intestinal irritation;
4 had pneumonia of right side;
1 had head affection resulting in mania;
1 had sloughing of pudenda;
1 had copious diaphoresis;
2 had menorrhagia;
1 had dysentery;
1 had erysipelas;
79 had pure typhus, or complicated to such a slight degree that it is not noted.

Of the 14 deaths in typhus—

Those at or under 20 were under treatment 9 days.
... 40 ... 16 days.
... 60 ... 22 days.

Of the 114 cases of typhus, an eruption of a measly or petechial nature was present in them all, with the exception of 4, and *one* of these 4 died. In 7 the exanthem passed into petechiæ.

Of the cases of typhus complicated, 21 in number, and that recovered—

12 were at or under 20
4 ... 30
3 ... 40
2 ... 60

They averaged 37 days' residence in hospital.

Of the typhus cases that had no complication noted, and that recovered, 79 in number—

38 were at or under 20
19 were between 20 and 30
12 ... 30 and 40
5 ... 40 and 50
2 ... 50 and 60
3 whose ages are not mentioned

They averaged 25 days' residence in hospital.

There were 177 cases of relapsing-fever, of which one died.

She died of dysentery, complicating and following after the fever.

Of the cases of this form of fever—

58 were admitted at or under the age of 20
56 . . 40
19 . . 60
1 was admitted above . 60

The ages of the remainder have not been recorded.

In 84, the precise *day* and *nature* of the critical evacuation has been recorded.

Of *the day*, in 84 cases—

In 47, the crisis occurred on the 5th day, the relapse on 14th day.
14, ... 6th, ... 14th ...
8, ... 7th, ... 14th ...
6, ... 6th, ... 15th ...
2, ... 6th, ... 18th ...

In 10 more, in which both are mentioned, the crisis took place at irregular intervals above the 5th from crisis and 14th from relapse; the highest being the 9th from crisis and 22d from relapse.

In 28 cases, the period alone of the crisis is preserved.

Of these the crisis occurred in 13 on the 5th day,
13 on the 6th ...
2 on the 7th ...

In the remainder, no periods either of crisis or relapse are recorded. It was observed that at the beginning of the epidemic, the crisis and relapse took place with great regularity; but, as the disease waned, the periods became more irregular.

Of the nature of the crisis. The crisis was often ushered in with rigors, occasionally most violent. The nature of the evacuation was generally a diaphoresis, occasionally epistaxis, and, in a few instances, by both combined.

In 2 by diuresis,
1 by diarrhœa,
2 by menorrhagia.

Sometimes the critical evacuation was ushered in by delirium; in a few instances most violent, and requiring restraint.

Of the 141 cases of relapsing fever, 33 were complicated—
2 had bronchitis;

4 had jaundice;
6 had diarrhœa;
2 had dysentery;
7 passed into typhus;
3 had most obstinate articular pains;
1 laryngitis, requiring tracheotomy;
1 had sordes on teeth;
2 had petechial eruption, and had been suffering from starvation;
3 had severe critical epistaxis, requiring the use of the plug;
2 had severe menorrhagia.

Average period of duration in hospital, 20·5 days.

Tents.—Females.

Comparative duration of cases of typhus and relapsing fever before admission.

TYPHUS.		RELAPSING FEVER.	
5 admitted on	2d day of disease.	2 admitted on	1st day of disease.
7 ...	3d ...	13 ...	2d ...
16 ...	4th ...	16 ...	3d ...
13 ...	5th ...	18 ...	4th ...
13 ...	6th ...	25 ...	5th ...
9 ...	7th ...	18 ...	6th ...
10 ...	8th ...	16 ...	7th ...
5 ...	9th ...	5 ...	8th ...
5 ...	10th ...	3 ...	9th ...
1 ...	11th ...	2 ...	10th ...
3 ...	12th ...	1 ...	11th ...
3 ...	14th ...	6 ...	14th ...
2 ...	15th ...		
1 ...	16th ...		

It will be observed from the above table, that the admissions in typhus are greatest on the fourth, fifth, and sixth days of the disease, but that it is more gradually extended over the other days than the relapsing disease, in which the greatest number of admissions by far took place early; the intense type of the fever leading the patients to seek assistance and hospital relief sooner. While it dwindles down to one on the eleventh day, we find a decided increase again on the fourteenth day.

Of the 312 cases treated in tents, 14 were cases of *continued fever*. There were no deaths. Average duration of them in hospital, days, 22·5.

There were 2 cases of dysentery without fever, which recovered.

3 of febricula, }
1 of variola, } all recovered.
1 of bronchitis, }

Of the deaths from other causes not precisely specified, the one died almost immediately after admission; the other, a child, came in emaciated and cold, obviously dying from starvation—two deaths; number previously recorded, fifteen; making seventeen in 312 cases, or one in 20¼.

It may be well here to state generally the kind of weather which prevailed during the months in which the tents were used for the accommodation of the fever patients. The weather was exceedingly warm, with much sunshine in the month of May and early part of June; the termination of June, however, and July, proved more variable; unclouded days and fair weather, with genial breezes, being followed by damp and rainy weather, and occasionally a cold east wind blowing from the sea. Considerably more rain began to fall than usual as autumn advanced, and cold weather set in early—in fact, from the general state of the weather throughout the period that these tents were in use, the weather may be said to have been favourable at first, but exceedingly unfavourable afterwards. I annex a table of the state of the barometer, thermometer, rain-guage, and winds, during the months that the tents were in use, taken from Dr Stark's Meteorological Register, appended to his Mortality Returns for 1847.

Month.	Barometer.				Thermometer.				Rain in Inch	Wind's Gener. Direc.
	Max.	Min.	Mean.	Range.	Max	Min.	Mean.	Range.		
May..	30·28	29·12	29·70	1·16	77	32	50·88	45	4·77	W. E.
June.	30·33	29·10	29·64	1·23	76	38	57·83	38	1·79	W.
July..	30·14	29·48	29·77	0·66	83	42	61·22	41	1·37	W. E.
Aug..	30·18	28·99	29·68	1·19	77	37	58·22	40	0·91	S.W.W.
Sept..	30·19	28·46	29·53	1·73	66	31	50·98	35	1·25	W.

Statistics of Shed F.—Females.—Accommodating from 50 *to* 60 *Patients.*

Length of shed, 192 feet; breadth, 20 feet; height, 10 feet, exclusive of 6 feet 9 inches of run for the roof.

This long building was divided into three compartments, with a separate door to each. It had twelve windows on each side, and twelve ventilators in the floor and roof,—four for each compartment.

The total number of cases treated in this shed in seven months, from October 5, 1847, to April 5, 1848, was 418, of which the disease of

73	was not recorded.	Total deaths, .	39
41	had continued fever.	In relapsing fever,	4
137	relapsing ...	... typhus, ...	32
167	typhus ...	... others, .	3
——			— 39
418			

being 9·33 per cent.

Of typhus cases, there were 167—deaths, 32—being 19·16 per cent., or 1 in every 5·21 cases.

Of the 32 deaths—

4 died of bronchitis complicated with typhus.
1 ... diarrhœa ......
1 ... tracheitis ......
7 ... dysentery ......
9 ... pneumonia ......
3 ... pleuritis ......
1 ... abortion ......
1 ... œdema ......
1 ... apoplexy ......
4 ... pure typhus.

Of the typhus cases that recovered, the complications were numerous, but, owing to a reason which I formerly assigned, such a minute and accurate account of them has not been kept as could have been wished; it will therefore be unnecessary to relate the few which have been recorded.

Of the typhus cases, 167 in number—

Those at or under 20 years of age amounted to 48
...... 40 88
...... 60 22
Cases whose age is not mentioned, . 9
Total, 167

Of the 32 deaths—

4 were at or under 20 years of age.
17 ...... 40 ...
3 ...... 60 ...
4 were above 60 ...
4 are not mentioned.
32

Average duration of typhus cases in hospital, 22½ days.

Relapsing Cases of Shed F.

There were 137 cases of relapsing fever in shed F, of which 4 died.

Of the 4 deaths—

1 died from peritonitis on the 6th day of disease.
1 ... purpura ... 20th ...
1 ... erysipelas ... 37th ...
1 ... pneumonia, no date.

Of the complications in those that recovered, no very accurate account has been kept: they were of the usual description. One, however, shall be mentioned in the sequel.

Of the relapsing cases—

Those at or under 20 years of age amounted to 64
...... 40 47
...... 60 11
Those above 60 2
... whose ages have not been recorded, 13
137

The dates of the crises and relapses are rarely recorded.

Of the above number, 15 cases of crisis took place on the 5th day of disease.

The duration in hospital averaged 18·9 days.

Of the other diseases—

9 had febricula.
25 ... continued fever.
2 ... variola.
1 ... anasarca and disease of heart.
1 ... pneumonia.
1 ... pleurisy.
1 ... dysentery.
1 ... catarrh.

The 3 deaths occurred in the cases of anasarca, dysentery, and pneumonia.

In shed F, the comparative duration of cases before admission were as follows:—

Typhus.			Relapsing Fever.		
4 admitted	on 2d day	of disease.	3 admitted	on 2d day	of disease.
9 ...	3d	...	16 ...	3d	...
16 ...	4th	...	24 ...	4th	...
19 ...	5th	...	17 ...	5th	...
10 ...	6th	...	15 ...	6th	...
14 ...	7th	...	5 ...	7th	...
43 ...	8th	...	26 ...	8th	...
8 ...	9th	...	3 ...	9th	...
12 ...	10th	...	8 ...	10th	...
4 ...	11th	...	11 ...	14th	...
9 ...	14th	...			
5 ...	21st	...			

Statistics of Shed C.—Males.

Number of beds, from 25 to 30.

From May 17, 1847, to March 28, 1848.

Total number of cases treated, 412; total mortality, 41, being 9·95 per cent.

Typhus Cases, 142; deaths, 28. 19·71 per cent.

Of the 28 deaths, 21 died from complication, chiefly inflammatory; and 7 from pure low typhus. Average duration in hospital, 22⅓ days.

Relapsing Cases, 146; mortality, 6. 4·11 per cent.

Of the 6 deaths they were all complicated,—1 with dysentery, 1 jaundice, 1 dropsy, 3 pneumonia. Average duration in hospital, 18·2 days.

Cases of continued fever,—febricula, bronchitis, &c. &c., 65; mortality, 7. 10·77 per cent.

Diseases not mentioned, 59.

A complete record of the ages has not been kept.

Shed C.—Males.

Comparative duration of Cases before admission.

TYPHUS.	RELAPSING FEVER.
2 admitted on 2d day of disease.	3 admitted on 2d day of disease.
5 ... 3d ...	3 ... 3d ...
7 ... 4th ...	8 ... 4th ...
10 ... 5th ...	16 ... 5th ...
9 ... 6th ...	12 ... 6th ...
2 ... 7th ...	9 ... 7th ...
9 ... 8th ...	6 ... 8th ...
3 ... 9th ...	2 ... 10th ...
6 ... 10th ...	7 ... 14th ...
3 ... 14th ...	None admitted after 14th day.
1 on other days up to 21st.	

Statistics of Shed E.—Males.

The number of beds occupied in this shed ranged from 50 to 65. It was opened on June 27, 1847, and continued so till February 28, 1848. During this time it was under the care of three physicians,—Dr Robertson, Dr Coldstream, and myself; and I have drawn out the record of the treatment during the whole period that it was open, namely, eight months.

Length of shed, 168 feet (one compartment); height, 10 feet, with 6 feet 9 of run for roof; width, 19 feet 6 inches.

There was a door at each end; nine windows on one side, the other side being occupied by a blank wall against which the erection was placed; nine ventilators in the floor and roof.

During the above period, 399 cases were treated in this ward, of which 55 died. Total mortality, 13·78 per cent.

There was typhus cases 116; mortality, 37. 31·90 per cent.

Relapsing cases, 179; mortality, 9. 5·02 per cent.

Continued fever, febricula, rubeola, variola, diarrhœa, &c. &c., 104; mortality, 9. 8·65 per cent.

In consequence of circumstances previously explained, as well as the frequent changes both of physicians and clerks, the record of this ward is not so perfect as we could have wished.

The character which the different kinds of fever presented at different periods of the year, was somewhat curious. An idea was prevalent that the short cases presented themselves in larger proportions during the spring and summer months, and that towards winter typhus became most prevalent. The following table shows this belief not to have been well-grounded, as rather a higher proportion of short cases was admitted during the winter months than during the summer. I do not consider, however, that the results which are annexed are at all conclusive on the point, as chance might have thrown a greater number of one kind of cases to one ward at one time more than at another. They are sufficient to show that no great amount of difference could exist.

TABLE showing the relative proportion in which cases of relapsing fever and typhus were admitted into the wards (marked below) of the Royal Infirmary, from the month of May 1847 to March 1848.

	Tents.		Shed E.		Shed F.		Shed C.		Total.	
1847.	Short	Typh.	Short	Typh.	Short	Typh.	Short	Typh.	Short	Typh.
May, - -	13	16	...	...	...	...	7	20	20	36
June, - -	20	25	25	8	...	...	30	27	75	60
July, - -	65	29	25	14	...	...	23	9	113	52
August, -	38	21	...	...	...	...	23	18	61	39
September, -	24	5	6	4	...	...	19	14	49	23
October, -	Tents were given	up in September.	20	11	20	23	10	11	50	45
November, -			51	15	27	33	13	5	91	53
December, -			26	14	28	30	6	8	60	52
1848.										
January, -			29	20	31	36	10	6	70	62
February, -			9	6	18	20	7	15	24	41
March, -			...	...	17	17	7	15	24	32
Total, - -	160	96	191	92	141	159	155	148	647	495

Or, if we divide them into seasons, the difference is as follows during the summer, autumn, and winter months.

	Relative Numbers.	
	Short.	Typhus.
Summer, .	208	148
Autumn, .	160	107
Winter, .	221	167

TABLE of average mortality in different wards.

Shed E.—Males.

Typhus cases, - -	116	
Mortality, - -	37	- 31·90

Shed E.—Males.

Relapsing cases,	179		
Mortality,	9	5·02	
Continued fever, febricula, &c.	104		
Mortality,	9	8·65	
Total cases,	399		
Total mortality,	55		13·78 per cent.

Shed C.—Males.

Typhus cases,	142		
Mortality,	28	19·71	
Relapsing cases,	146		
Mortality,	6	4·11	
Continued fever, febricula, &c.,	65		
Mortality,	7	10·17	
Total cases,	412		
Total mortality.	41		9·95 per cent.

Shed F.—Females.

Typhus cases,	167		
Mortality,	32	19·16	
Relapsing cases,	137		
Mortality,	4	2·92	
Continued fever, febricula, &c.,	41		
Mortality,	3	7·31	
Total cases,	418		
Total mortality,	39		9·33 per cent.

Tents.—Females.

Typhus cases,	114		
Mortality,	14	12·28	
Relapsing cases,	177		
Mortality,	1	·56	
Total cases,	317		
Total mortality,	17		5·36 per cent.

Upon glancing at the result of these statistical data, we first observe the difference in the mortality of males and females—the average of the males being 12 per cent; that of the females 7 per cent. The next glance demonstrates the advantages to be derived from the treatment of fever cases in open sheds temporarily erected, even in winter weather; for, while the mortality of fever generally throughout the Hospital, between October 1846 and October 1847, was, for males, 15·42 per cent., and females, 10·03 per cent., that of our tents, sheds, and temporary accommodation was, for males, 12 per cent., and females, 7 per cent. To what is this saving of human life to be attributed? It appears to me, if we glance at the nature and localities of these temporary erections, we shall find a solution to the whole question, and that is, in the more perfect state of ventilation in which the patients are placed. The shed, or temporary erection which has the highest rate of mortality of those with which I was connected was E. The mortality here was 13·78 per cent., being still, however, even nearly 2 per cent. below the average mortality of the whole house for males.

The explanation of this fact may, I think, be found in the position of this shed, in the large number of cases which were placed in one compartment, and in the want of proper ventilation in some parts of it.

This shed was built against the high enclosing wall at the back of the Infirmary; on each side of it were placed other sheds to the same height. It had a door at each end, ventilation in the roof and floor, and windows only on one side; there were also two stoves at respective distances inside. From this position, little or no thorough ventilation could take place in either way, and that which generally went on was through the open windows and ventilators in the roof. Consequently the patients placed in the corners of the ward, as well as those who were placed against the wall, had not the air so frequently renewed as was necessary. Besides, the great number of cases congregated together in one compartment had the effect of increasing the length of residence in the hospital, as well as exposing the patients to other forms of the disease. Many patients, while I attended this ward, after passing through relapsing fever, took typhus, and were cut off; and many were also lost after typhus with dysentery. The contrast between the cases in this shed and the one next to it, C, at the same time, was often striking, and could not be explained in any other way than in the better position and ventilation of this latter shed. Indeed, of shed C, I have heard the superintendent express his conviction that, in making his night rounds, he generally found this ward the best aired of the whole house.

The construction of this shed, C, is perfectly different from that of any of the others. It was formerly used as a mattress shed, in the drying and making of which plenty of air was necessary. In addition, then, to windows on the one side, a door at the one end, and fire-place at the other, a large portion of the side is sparred, and moveable like window-blinds, and thus calculated to admit a perfect renewal of air throughout the whole ward. There was only one compartment in this ward; but the number of patients was much fewer than in shed E; there was seldom half the number—say from twenty-five to thirty.

The mortality of this shed, then, has only been in males 9·95 per cent., or in round numbers 10 per cent.;—5 per cent. lower than the average of males in the house, and 3 lower than the average of shed E.

But let us go further. Shed F was erected for females. It was a long one (192 feet); but the managers were kind enough, at my suggestion, to direct that it should be divided into three compartments, separate from each other. There was the most perfect ventilation in this shed. It was erected in an open space of ground, with windows at both sides, and opposite each other, with ventilators in the floor and roof, and a separate door to each compartment. In this way a thorough current of air was established not only from side to side, but from above and below; and in addition, the shape of the roof sloping on each side upwards towards the ventilators, enabled the heated and noxious air to be more completely removed. The result of the treatment here was 9 per cent. of mortality, being 1 per cent. less than that of the females throughout the house. But the most perfect proof of the correctness of the statement I have made,—that the success of the treatment in these out-buildings depended on the more perfect nature of the ventilation,—is afforded by the tents. The result here, it will be observed, is remarkable, being only 5 per cent.; that of the house, by which I compare this, being 10 per cent. Or in other words: by treating the patients in tents during the summer months, a saving of human life is gained to the extent of 5 per cent.

I am aware that a strong feeling existed at the time against these erections; some believing that the heat and light of the summer months would injure those labouring under head complications; others stating that the cold air and dampness of the evenings and nights, and especially rainy weather, would injure those labouring under chest affections; while others affirmed that our convalescents would suffer. I may state that I never attended with greater pleasure a series of cases of fever, than I did in these tents. Ordinary cases did so well, and bad cases proceeded so favourably, that it was a pleasure to all concerned with them. As I was not connected with the admission of patients, I cannot say whether or not there was any choice made by the admitting physicians in the patients they sent to the tents. This I can state, however,—and I refer with confidence to the gentlemen who acted as my clerks at the time (Drs Aitken and Chalmers),—that the number of bad typhus and other cases admitted into the tents bore an equal proportion to that of the other wards; and that on admission, the general character of the cases was similar to what we saw elsewhere. I state distinctly that, *cæteris paribus*, the cases did better in the tents than elsewhere. Those with tendency to affection of the head seemed to do as well, while those labouring under chest affections, as bronchitis, pneumonia, &c., did much better. Our convalescents, too, seemed to like their quarters so well, that we could hardly get them to leave us; which fact is distinctly proved by the table which I have annexed of the duration of the different kinds of cases in different wards. By it we find that the period of residence in the tents is highest both in typhus and relapsing cases. It will be observed that these tents were only in use during the summer months; and the benefit arising from their use corresponds and bears out an important fact which has been long known to the profession, viz. that a greater number of cases seem to recover in the out-houses, and more especially in country cottages or huts, than do in hospital practice. This observation was long ago made in Ireland, and subsequently by Dr Alison in his account of the fever epidemic of 1826–27; and I entirely agree with him in the bad effects which removal, and especially late removals, have upon the recovery of the patients sent to hospital. In addition, however, to the effects of removal, they are placed in a ward amongst a great number of patients labouring under the same disease; and unless the place is thoroughly ventilated, I am satisfied that the patients suffer by the combination. In the tents we noticed the effects of free ventilation and subdivision of the cases in the most perfect way. It seemed to act as a stimulus to the constitution to make greater efforts to throw off the disease, the complexions of the patients soon assumed a brighter aspect, and a much smaller amount of stimuli was required throughout the disease. When we combine the success of the treatment in these tents with the comfort experienced both by patients and attendants, the little expense that such erections cost, and their being useful on more occasions than one, it would be but justice to give them, in any future summer epidemic, a fair and fuller trial.*

If a building could be produced, which would combine the open canvas covering and free ventilation of a summer tent, with the power of changing it at once and without removal of patients into a substantial winter abode, it would enable those who have the management of temporary erections, on such emergencies, to put more fully to the test the striking result of the statistics of the treatment of fever which I have just laid down.

Some rough ideas, which my experience in these matters enabled me to suggest, have been kindly put into proper shape by my friend Mr Peter Hamilton, architect.

The short explanation which I have annexed will be better understood by reference to the plan.

Supported on square stone bases, a little elevated from the level of the ground, let wooden or cast-metal pillars be erected at regular distances of ten feet, and ten feet high; from the top of each pair of pillars let beams be placed, as will be seen in the drawing, for the support of the roof; and also beams laid across the stone bases of the pillars, and a flooring laid down upon them, so arranged that a proper ventilation of air shall take place beneath the floor. The sides are to be composed of square frames, made to fit between the pillars, and to be fastened to them with bolts. These frames are to be composed of boards, with their lower edges overlapping the other. Some are to have windows in them for the purposes of light and ventilation, and others to have the boarding so arranged that it shall shut or open like window-blinds. It will be obvious, therefore, that these pillars being placed at the distance of ten feet, and their height being the same, the ten feet square frames will fit into and between any of them, and that a frame can be placed either with or without a window, or with the moveable boards, according to the pleasure of the architect, or taken away and changed at pleasure. On the roof frames previously mentioned let a canvas covering for the summer months be stretched, and so contrived as to hook up, like the reefs of a sail, for the purposes of ventilation. This canvas covering to be displaced by a new substantial roofing for the winter months, in the shape of frames of wood built in the same way as the frames for the sides of the building, and which are to be bolted on to the roof beams as required. This, of course, can be done in short space of time, and without the removal of the patients.

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* In Dr O'Brien's account of the epidemic of 1826–27, he mentions the erection of a shed in the garden of the Meath Hospital, capable of containing 240 patients; also of a series of tents in the lawn, which accommodated 180 more. No mention, however, is made of the result of the treatment in these places.

I am also aware that tents were erected in connexion with some of the hospitals in Ireland, and also in America, during the present fever; and although I have received accounts from physicians in some parts of Ireland of the successful result of the treatment in them, yet I have not been able to procure any statistical data.

This must obviously be the most economical, most comfortable, and easiest to put up and take down of all forms of temporary erections, since we find a similar plan adopted by all those who use buildings which require to be removed from place to place; and the advantages which would accrue from the use of such a place over the method of erecting the sheds which have been in previous use are as follows:—

It would be economical in the first erection.

It could be increased or diminished in size at will, according to the numbers requiring accommodation, and without removal of patients.

It could be divided into as many compartments as wished by simply placing two frames together across the ward, which the measurement at once shows, the ward being twenty feet wide by ten high, while each frame is ten feet square.

It combines the most approved and perfect system of ventilation, with the canvas covering for summer and more substantial roof for winter.

It can be taken down and put up in a very short space of time, in consequence of the different parts fastening together with bolts and screws.

It can be laid past for future use in very small bulk, in consequence of the similarity in size of all the parts.

Average duration in Hospital.

TENTS. *Females.*	Typhus Fever,	Complicated, 37 days Uncomplicated, 25 days	aver. 31 days.
	Relapsing Fever,		20·5 ...
	Continued Fever,		22·5 .
		Average,	24·36 days.
SHED F. *Females.*	Typhus Fever,		22·5 ...
	Relapsing Fever,		18·9 ...
	Continued Fever.		
		Average,	20·7 days.
		General average of Females,	22·22 ...
SHED C. *Males.*	Typhus Fever,		22⅓ days.
	Relapsing Fever,		18·2 ...
	Continued Fever.		
		General average of Males,	20·18 days.
Average of Hospital in years 1846–47, in Typhus, Synochus, and Synocha,			31 days.

In the above table the average residence in the hospital, in the tents and sheds, is only 21 days, that of the house generally being 31 days. This may very properly be adduced as an argument in favour of the rapidity with which strength sufficient to enable them to leave the hospital is acquired by patients in those open buildings. I am inclined to attribute, however, the short residence in the hospital in these out-buildings to another cause; and that is, the numbers that we had to dismiss as soon as convalescence was sufficiently established to enable them to bear removal for the purpose of accommodating others. It is true this applied to all the wards of the hospital; but I think it must have been more felt in the extra accommodation than in the house itself, in consequence of the immense numbers that were treated in these buildings. Whatever explanation is adopted, the difference of ten days is difficult to be accounted for. The contagious nature of all the forms of fever of which this epidemic was made up, was abundantly proved by the records of the cases of fever which occurred amongst the attendants.

Of nine physicians acting in the fever wards, three were seized with fever, two having typhus, the other relapsing fever. One died.

Of twenty-two clerks successively occupied in some way or other with the fever wards, twelve had fever; eleven had typhus, one relapsing fever, and one of the twelve having both typhus and relapsing fever. Of the twelve three died.

Of the nurses and others whose duty it was to come near the fever wards, it may be affirmed that none escaped taking one or other form of the disease who had not had it previously, while some had both the prevalent forms of it, viz. typhus and relapsing fever.

The eruptions which have appeared during the course of this epidemic have been of two descriptions, the measly and the petechial.

The measly has been present in nearly every case of typhus, and often served, as it was principally depended on, to characterize the disease. It seemed generally most strongly marked on the trunk of the body; over the epigastric region, or between the shoulders, it was in general to be discovered there, if at all existing on the body. No prognostic character could be drawn from the early measly or typhoid eruption, or from its dullness or vividness, as regards the future mildness or severity of the disease. Its livid colour always marked a bad form of disease. In two cases this measly-looking eruption gradually passed into bright petechiæ, and it seemed to occur in the following manner. The eruption was a vivid one at the beginning, and although having an irregular shape, had a regular equable red colour. Gradually it became punctuated, and at last several of these puncta seemed to run into each other, and to form small petechial ecchymoses. Petechiæ themselves appeared but in a small number of the cases. This eruption was not confined to typhus, but was occasionally seen in the relapsing fever, but only in the first attack.

Much difficulty was experienced in distinguishing, in certain cases, between flea-bites and petechiæ. Thus we observed in certain whole families that every one was covered with purple-coloured marks much resembling ordinary flea-bites, the majority of them having central stigmata, and yet in such numbers that it was impossible for us to suppose that any individual could have been so much bitten. The explanation, I think, was afterwards arrived at. The cases in which the petechiæ were seen were principally those that came in in the greatest state of destitution, who had been filthily lodged, ill-clothed, and worse fed; and it was often observed in three or four members of a family coming in at the same time, and seemed to depend on the vitiated condition of the fluids of their bodies from destitution and want. In this way can be readily explained the numerous cases in which we found some of these petechiæ with central stigmata and some without them in the same person. The purpurous tendency existing in the constitution gave rise to an unusually large ecchymosis around every flea-bite, which otherwise would have been a mere point; in addition to these, however, the vitiated state of the blood was showing itself in numerous other purpurous spots, or true petechiæ. In fact, those with central stigmata were as good a criterion of the state of the patient's constitution (for it bore no reference to the kind of fever) as the purpurous petechial spots without it.

The complications which the present epidemic exhibited were of the usual varied character to be expected from such a mass of cases. A distinct connection was noticed to exist between the kind of weather which prevailed and the prevailing complications which the cases of fever exhibited when admitted. During the hot weather of the month of June, the number of cases admitted with head affection was remarked, while the changeable temperature and damp weather of the latter end of July and August brought an accession of cases with chest affections. Dr Christison some time ago noticed that the Edinburgh fevers were especially characterized by pulmonary complications; and I have no doubt that inflammatory affections of the lungs and pleura constituted the majority of those who died. This, of course, is attributable in a great measure to the changeable nature of our climate, and especially to the very great prevalence of influenza, which took place during the months of November and December 1847 and January 1848; a great number of the admissions during these months being affected with catarrhs and bronchitis, which complications in old people, and especially in the course of typhus, proved very fatal. The returns of the hospital generally show that in one week there were 52 deaths, and that in the month beginning with the last week in November and three first weeks of December 1847, the total number of deaths in the hospital were 164, the admissions being in that time 514; but there were remaining at the end of the previous week 532, which makes 164 deaths in one week out of 1046 cases, nearly sixteen per cent.

The next set of complications worthy of notice are those which in general constitute the smallest proportion in the epidemic fever of Edinburgh; I refer to intestinal lesions. On this occasion, however, they were also frequent; and Dr Bennett has very properly made the observation, that "this change took place at a time when scurvy and bad diet prevailed, circumstances often known to be associated with this form of fever in France and Germany."

The dothinenteritis prevailed chiefly during the spring and summer months, after which intestinal cases became less common, until the autumn months ushered in a much more extensive series of cases of dysentery. This, too, continued during the autumn and early winter months, and passed entirely away towards the spring of 1848.

I do not propose to enter into any description of the morbid appearances which have been observed in those dying of epidemic fever. Those presented by the Edinburgh fevers on former occasions have been well described by Christison, Craigie, and others; while the lesions occurring during the present disease have found an able historian in Dr Bennett, who, at the time, held the office of pathologist to the Royal Infirmary, and to whose communication* I beg to refer my readers.

I shall be equally brief as regards the general treatment which was pursued in the typhus cases throughout. Few or any of them could stand general depletion even for serious inflammatory complications. In one or two instances it was tried for pneumonia during the course of typhus and at an early stage of it; and although decided relief was obtained from it, yet the subsequent depression was so great, and so much more stimulants were required towards the close of the disease, that it was generally abandoned for local depletion. In addition to the usual remedies suited to the nature and seat of the local complications, Dr Stevens' Saline Powders were used as the common fever medicine, and I think their effect was clearly exhibited in brightening the colour of the eruption, and making less wine necessary. The cases of typhus, however, were generally of such a low type, that wine was requisite in most cases, and often from an early period of the disease. In the lowest form, carbonate of ammonia, along with considerable doses of camphor and whisky or brandy, produced in some cases decidedly good effects.

The treatment of the relapsing cases was very different. The inflammatory complications stood blood-letting, both general and local, well; and we did not hesitate to try to assist the critical diaphoretic evacuation by remedies of the particular class. I cannot say that any advantage was gained by this practice. The critical evacuation was often longest of arriving in those cases where, from the sufferings of the patient, we had most wished sleep to forward the critical evacuation. Much attention was paid, especially towards the beginning of the epidemic, to cut short the disease, and to save the patients from a relapse. Strict confinement to bed, a strict regulation of diet, low diet, common and full diet, quina, biberine, arsenic, were all tried in a certain series of cases, but without the least effect in warding off the relapse, not even in prolonging its recurrence for a single day. It came like a fit of ague almost to an hour.

As in intermittent fevers, the spleen and liver always suffered from congestion during the attacks of this disease. Soon after the rigor which ushered it in, an enlargement of these organs could be distinguished; they continued often even to increase in size, until, like the fever, they were resolved by the critical evacuation. It was astonishing how soon these enlargements, especially of the spleen, disappeared, after the crisis of the disease. In some instances, where the circumference of the dull edge of the organ had been marked on the skin by a line of the nitrate of silver, the next day, after the critical sweat, it had entirely disappeared, and been reduced to nearly its natural size.

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* Bennett's Journal for October 1847, p. 299.

One instance was so remarkable as to deserve especial notice. It was that of Martha Gifford, aged 28, admitted on the 28th of October with relapsing fever. She had the usual critical sweat on the 5th day, relapse on 14th, and second crisis by diaphoresis on the morning of the 17th day. On the afternoon of this day she observed a fulness and hard swelling on the epigastrium and left hypochondriac regions, which she attributed to the large quantity of water she had drank during the relapse. At the visit on the 12th November, the tumour was carefully examined. It was slightly painful to the touch; had a soft boggy feel, with circumscribed edges, and situated on the left side of epigastrium and left hypochondria, and extending from the xiphoid cartilage to about two inches above, and to the left side of the umbilicus and crest of the ileum. The pulse about 86; tongue clean; bowels regular, but appetite impaired; no thirst. There was no pulsation in the tumour, nor was any sound to be heard with the stethoscope. At the suggestion of Professor Alison, who was kind enough to see the case, the tumour was blistered, and she had pills of calomel and opium internally, with solution of the iodide of potass. Next day no diminution had taken place in the tumour, and she was suffering a good deal from the blister. The day after, however, at the visit, the tumour had wholly disappeared, leaving under the ribs, and in the direction of the spleen, a slightly-increased firmness, with slight tenderness on pressure, which left no doubt that the tumour had been only an enlarged, engorged spleen connected with the peculiar kind of fever. She was dismissed cured on the 19th November. No discharge of blood or other untoward symptoms followed the diminution of the tumour.

Art. IX.—*The Constitution and Diseases of Women. Part III.* By Charles Bell, M. D., Fellow of the Royal College of Physicians, Edinburgh. (Continued from Vol. lxii. p. 330.)

Amenorrhœa.

Suppressio mensium generally results from the same causes, and is attended by the same train of symptoms as *Emansio Mensium*, differing only in the period of its attack; and in such cases, therefore, it requires a similar mode of treatment. But in some instances, suppression differs so essentially from delayed menstruation, as to render a separate description necessary in order to comprehend its varied character, and enable the practitioner to adopt the appropriate treatment.

As the name indicates, this disease takes place only after puberty, and after the catamenia have been regularly established. It may occur in women of all ranks of society, and of every shade of constitution, throughout the whole period of menstrual life; but it is more generally met with in those of delicate constitution and nervous temperament, and in those of sanguine habit of body, apparently from their greater susceptibility of sudden shock to the constitution, and tendency to local congestion or inflammation. Such individuals, therefore, should, as much as possible, guard against exposure to its exciting causes.

The nature of suppression will be best illustrated under the two heads into which it may naturally be divided; namely, the idiopathic and sympathetic. The disease may properly be termed idiopathic when the *uterus* is primarily affected. The sympathetic form arises from a morbid condition of some other organ, and is not necessarily attended by disease of the *uterus*. Therefore, when the organ primarily affected is relieved from disease, the uterus resumes its functions.

It is of great importance to attend to this distinction in practice, as the *uterus*, from being merely in a passive or dormant state, the result of its sympathy or proximity with the diseased organ, by which its supply of blood or nervous energy is interrupted, may be roused into an active state of disease by the application of improper remedies, rendering the case complicated, and increasing the sufferings of the patient, and retarding the cure.

The diseases of the *uterus* giving rise to *amenorrhœa* are numerous and important; but on the present occasion it is intended to treat only of those morbid affections over which medical treatment, when judiciously applied, seems to exercise a decided control, leaving for future investigation the more serious and malignant diseases, the sources of the most incurable form of *amenorrhœa*.

The milder diseases of the uterus, although comparatively simple in their nature, and generally yielding rapidly to the suitable remedies when early administered, yet are liable to become unmanageable and dangerous if neglected or improperly treated. In this case, they give rise not only to great suffering to the patient, but become the most common cause of sterility; while, at the same time, from the extensive influence of the uterus over the whole female system, fatal diseases may be induced in some other organ.*

The idiopathic form of *amenorrhœa* is much influenced in its character by the circumstances under which the patient is exposed to its attack. The suspension of the menstrual function, therefore, may take place suddenly during the monthly period, or the catamenial discharge may not appear at the regular time; or it may gradually diminish from month to month until it entirely ceases, in this respect resembling the mode in which suppression generally takes place in sympathetic *amenorrhœa.* This difference in the progress of the disease has given rise to its being divided into the acute and chronic forms by many of our best authors; although these terms might with more propriety be used to distinguish the two forms into which *amenorrhœa* has been divided in this paper.

The symptoms of this form of suppression vary in different individuals according to the constitution and state of health at the period of attack, as well as the suddenness with which it takes place. When it occurs in a healthy and robust woman, the symptoms are in general so severe as to render the immediate attendance of the physician necessary. It more frequently happens, however, that the indications of the disease are comparatively more moderate, and they seem to yield to the domestic remedies used by the patient; and she is too frequently led by a natural but mistaken delicacy to conceal her ailment, until her general health begins to suffer from the uterine derangement; or disease is induced in some other organ, for which medical advice is required. It is not unusual, therefore, for the medical attendant to find that suppression has been of long standing; and he is only made aware of its existence incidentally in the course of his inquiries as to the cause of a different disease. This fact shows the propriety and importance of an inquiry into the state of the catamenia before prescribing for a female during the menstrual period of life; for although the inconvenience arising from suppression may occasionally be so trifling that the patient thinks it unnecessary to mention it, still this state always exercises a remarkable influence over other diseases, rendering them in general more unmanageable; and if it should so happen that the physician has overlooked this important functional derangement, he will not only fail in his duty to his patient, but expose himself to the imputation of neglecting an obvious induction of practice.

In the investigation into the nature and treatment of suppression it is highly important that a distinction should be made between those symptoms which are so generally present as to be in a great measure pathognomonic of the complaint, and those incidental affections which seem to be induced in constitutions prone to disease in individual organs, and which is too frequently in a dormant state, only requiring some disturbance in the system to rouse it into activity.

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* Churchill's Diseases of Females, page 78.

Symptoms.—Idiopathic amenorrhœa usually comes on with a rigor, varying in severity, which, if the attack occurs at a monthly period, is followed by immediate suppression of the catamenia, pain in the loins and lower part of the back, nausea, severe headach, flushing of the face, hot skin, rapid pulse, foul tongue, loss of appetite, thirst, constipation; frequently pain and a burning sensation in passing urine; occasionally cutaneous eruptions, lassitude, and disinclination to any kind of exertion. If the disease be prolonged, many of these symptoms are sometimes modified in their intensity, even when no remedial means have been resorted to, and they gradually assume a chronic character, in which the general appearance of the patient is greatly changed. The complexion is a greenish yellow, the lips pale, and there is a peculiar blueness under the eyes, and the whole expression of the countenance is inanimate. The appetite is capricious, and there is generally a desire for the most indigestible and disgusting substances. The abdomen occasionally swells, and the patient is rendered very uncomfortable from a tympanitic state of the bowels. She complains of weight and dull pain in the situation of the spleen, which, according to Baillou,* becomes enlarged. There is considerable bearing down of the womb, with occasional leucorrhœa; œdema of the feet, which sometimes have a mottled blue appearance. Palpitations and dyspnœa come on with the slightest exertion, and are accompanied by a troublesome cough.

Although these are the symptoms usually met with in severe cases of amenorrhœa, they are not all present in every case; but when they do occur, they generally disappear as soon as the catamenia are restored. In this respect they differ from those incidental diseases or complications which occasionally appear in patients suffering from amenorrhœa, and which some authors have considered as being produced by it.

Incidental Diseases.—The diseases which are enumerated as consequences of amenorrhœa are apoplexy, epilepsy, hysteria, syncope, madness, palsy, spasms, various neuralgic pains, phthisis, cutaneous eruptions, salivation, hemorrhages, leucorrhœa, &c. The more serious diseases in this list, however, are fortunately of rare occurrence, as they are always alarming, and some of them inevitably fatal.

The opinion that discharges, whether hemorrhagic or leucorrhœal, consequent upon amenorrhœa are favourable complications, or the result of a salutary effort of the constitution to mitigate the symptoms of the disease, is not well founded; and it is to be regretted that the term vicarious menstruation should have been adopted with reference to such evacuations, as it is calculated to mislead the inexperienced. Nor can it be otherwise, seeing that the idea is supported, and the term adopted, by some of the most celebrated modern-authors. Dr Churchill calls it "a very curious deviation from normal menstruation, and says that it seems a provision for, in some degree, mitigating the constitutional effects of suppressed menstruation, by substituting a similar discharge from some other part."[*] Again, "when the system is generally suffering from consequent plethora, or irregular distribution of blood, an attempt is made by the natural powers to afford relief by a discharge of blood from some other part.[†]" Ashwell asserts that "this vicarious discharge can scarcely be regarded as a disease." "That so far from structural change taking place in the vicarious organ, its functional disturbance is slight, and the amount of subsequent constitutional disorder is only proportioned to the blood lost."[‡]

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* De Virginum et Mulierum Morbis, Tom. iv, p. 75.

It is incomprehensible why an evacuation of blood occurring at irregular periods from a diseased or debilitated surface, and arising from an unhealthy state of the system, should not only not be regarded as a disease, but as an indication of healthy action. Neither does it appear clear in what respect such an evacuation resembles menstruation, nor in what degree it can be deemed a substitute for it, when we consider how necessary that secretion is to the well-being and comfort of the female, and how completely it depends in its normal state on the healthy condition of the womb; being thrown off not only without producing debility, but generally without any inconvenience. Every practitioner of any experience must have observed that incidental evacuations seriously embarrass and complicate the treatment of amenorrhœa, and that they almost invariably produce injurious constitutional effects. That hemorrhagic discharges are irregular in their periods of recurrence, and morbid in their source, is proved by the writings of the very authors whose opinions have just been quoted, and also by other high authorities. Astruc says, "The deviating menses are seldom exactly regular, either as to time or duration, of the returns; or as to the progress, or diminution of the discharge. It is not, therefore, strange, that a plethora alone should produce them. Their regularity agrees perfectly with the nature of such a cause; which is, of itself, always unequal, and variable." "Lastly, the deviating menses lead almost always, to the ulceration of the parts, where they deviate, which proves, that they happen only by the dilaceration of the vessels, which the plethora bursts."[§] Dr Locock,[‖] while he quaintly calls this discharge "a curious freak of

[*] Theory and Practice of Midwifery, page 57.
[†] Diseases of Females, page 83.
[‡] Diseases of Women, pp. 92, 93.
[§] Astruc, vol. i. page 162.
[‖] Cyclopædia of Practical Medicine, vol. i., page 70.

nature," informs us that "it appears to depend principally upon a torpid or amenorrhœal condition of the uterus, and 'it also usually seems necessary that the vicarious outlet should be already in a weak, irritable, or disordered condition.'"* Churchill states "that the locality of the vicarious discharge is often determined by previous delicacy of an organ or tissue;"† and "at the first outbreak, this curious phenomenon may occasion both alarm and difficulty occurring in females of weak constitution and delicate organs." Ashwell, while he denies that there is any proof of the part from which the vicarious discharge flows being "in a disordered, irritable, or weakened condition," says in an afterpart of his work that "local pain, constitutional irritability, and hysteria, are often premonitory of its periodical approach;" and that, "where the mammæ are the seat of the hemorrhage, there is often the formation of a crust over the affected spot, which being thrown off, the bleeding occurs." He also refers to a case in which the "surface and edges of a large menstrual ulcer on the thigh were invariably more painful, hot, and swollen, prior to its furnishing the vicarious evacuation." He assigns as the cause of this evacuation, "the sudden or even gradual supervention of plethora or congestion:" and he concludes with the following pertinent remarks—"but why this form of menstruation should occur so rarely, if it be preventive or curative of those morbid conditions, is a question which I cannot answer."‡

From these extracts, the correctness of the inferences stated in which is fully supported by careful pathological observation, it is obvious that the incidental evacuations of blood met with in those suffering from amenorrhœa, depend generally on a weakened or morbid state of the system; they also frequently have their source in local disease of the discharging organ. It is very important to bear this in mind in practice, as the treatment may prove unsatisfactory and ineffectual if there exist a constitutional peculiarity requiring different management to that necessary in simple amenorrhœa. It is therefore the duty of the practitioner, in every case in which there is the slightest tendency to vicarious hemorrhage, to make the most careful examination into the condition of the affected organ, and the habit of body, as well as the constitutional tendencies of the patient.

Hemorrhages during amenorrhœa are reported to have taken place from almost every part of the body; but they most frequently occur in the mucous surfaces, as in epistaxis, hæmatemesis, hæmoptysis; and although the quantity of blood which may be discharged from the nose or stomach may be much greater in the former cases than when the lungs are the affected organ, yet the hæmoptic discharge is incomparably more alarming and dangerous, demanding the most watchful attention of the physician. Such cases proving often the most disastrous, and always, even when relieved, the source of great anxiety as to the ultimate safety of the patient.

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* Cyclop. of Pract. Med., vol. i. pp. 70, 71. † Op. cit. p. 84. ‡ Op. cit. p. 93.

Uterine leucorrhœa is regarded as another form of vicarious menstruation, and has been viewed in the same erroneous light, and supported with similar inconsistencies as have been entertained with regard to vicarious hemorrhage. After enumerating the various secondary symptoms which may appear in amenorrhœa, Dr Churchill agrees with Friend[*] in supposing that those suffer less from that disease who have leucorrhœa; that it "will considerably mitigate the severity of the secondary attacks;" and it "appears to afford relief also, and more naturally, in as much as the uterus being in action, even though the product of that action be faulty, gives more hope of the re-establishment of the healthy function than when that organ is perfectly quiescent, and, as it were, paralysed."[†] Nauche regards leucorrhœa as a salutary process;[‡] and Ashwell guardedly expresses the same opinion, making, at the same time, the still more extraordinary mistake of supposing that the leucorrhœal discharge is furnished by the same vessels as the catamenia. "It is difficult" (he says) "to explain by what diseased action it is, that vessels accustomed to eliminate a sanguineous fluid should so far lose their full secretory power as to furnish only an increased amount of mucus."[§] Although this opinion was entertained by Sylvius, Leake, Cullen, and other authors of the last century, there is reason in the present day to expect more correct notions with regard to the physiology and pathology of the uterus. Nothing can be more inconsistent with modern views than to ascribe to the same glands the secretion of the leucorrhœal and catamenial discharges. Such a circumstance would indicate an anomaly in the organization of the uterus which is found nowhere else in the human body, viz. that the same glands should possess the power of secreting two distinct salutary fluids not only at different periods, but sometimes simultaneously, according as they are in health or disease. Were this the fact, it would not only prove an irregularity in the organization of the uterine system, but it would be a frequent source of discomfort and disease, by depriving the organ of its mucous protection at the very time it is most required. But that this suspension of the mucous discharge does not take place is proved by mucus being found in the menses when analysed;[||] and by leucorrhœa being frequently present while the catamenia are being secreted. This view is supported by Astruc, who says, that "the fluor albus that is intermittent, and happens without any suppression, begins commonly some days before the eruption of the menses; increases in proportion as the eruption approaches; continues certainly as long as the menses flow, though the discharge of them prevents it from being distinguishable."*

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[*] Emmenologia, p. 105.

[†] Op. cit. p. 78.

[‡] Maladies propres aux Femmes, Vol. ii. p. 646

[§] Op. cit. p. 96.

[||] De la Menstruation, par Brierre de Boismont, p. 278.

It is very evident that leucorrhœa has its seat in the mucous follicles of the uterus and vagina, and is wholly unconnected with the immediate source of the catamenial discharge; and that it is the result of irritation or disease in those organs. This opinion is fully supported by the following passages, taken from the works of those authors who assert its salubrious character.

When leucorrhœa supersedes the menses, Dr Churchill says, "There is considerable local suffering, a constant aching pain in the back, or, to speak more accurately, midway between the pubes and sacrum (*i. e.* in the uterus), a sensation of weight in the pelvis, and occasionally bearing down." "Severe headach, intolerance of light." "In a few instances I have known it (viz. the leucorrhœal discharge) to be very acrid, causing excoriation of the labia and surrounding skin." "If we consider the local distress, the increased secretion, the course of the disease, and the remedies which are most successful, we can have but little hesitation in attributing all to the effects of inflammatory action,—generally subacute or chronic,—of the mucous membrane lining the uterus."† Ashwell states that the natural mucus of the uterus has for its object the "lubricating the opposite surfaces of the organ, and preventing friction and adhesive inflammation. When excessive, constituting leucorrhœa, it is occasionally, and more frequently than blood, vicarious of the menstruation. Strictly speaking, there is amenorrhœa, because a mucous, instead of a sanguineous secretion, is furnished by the minute extremities of the uterine arteries." "But it (leucorrhœa) is a disease still; for in health there is an accurate relation between the amount of secretion and the purpose which it serves, viz. lubrication of the surface. When from any cause, its amount is increased beyond what is necessary for this important end, it is morbid."‡ He further states that "There can be no doubt that vicarious leucorrhœa depends not alone on *disordered action* of the secretory apparatus of the uterus, but also on the impoverished and attenuated condition of the blood; and, in those instances where the discharge is always present, we may probably infer the existence of subacute inflammation of the uterine lining membrane."§

It has been considered necessary to enter thus particularly into the discussion of the incidental circumstances which may attend suppression, because the best grounds for the hope of being successful in the treatment of that disease is by taking fully into

* Op. cit. Vol. i. p. 266. † Ib. p. 133, 134. 135. ‡ Ib. p. 95, 159. § Ib. p. 95, 96.

view the evils to be encountered; and it must be evident, from what has been now stated, that leucorrhœa depends on the existence of local disease, not unfrequently accompanied by a morbid state of the constitution; and that neither leucorrhœa nor vicarious hemorrhage can safely be considered as a salutary complication of amenorrhœa. On the contrary, the physician must be prepared to combat a state of more extensive disease, and consequently to pursue a more tedious and complicated course of treatment.

Cause.—Idiopathic amenorrhœa most frequently arises from a sudden change of temperature immediately after exercise, particularly when the patient is exposed to a check of perspiration. It is therefore produced by exposure to thorough draughts of cold air, scanty clothing, damp feet,[*] cold drinks, imprudent indulgence in ice, the sudden contact of cold substances, as dropping a key down the back,[†] sitting on damp or cold grass.[‡] The effects of cold and moisture, however, are modified by custom, it having been found that "the bathing women," who go into the sea at all times, are not particularly liable to this disease.[‖] Suppression may be occasioned by violent exertion during the monthly period, such as dancing, long walks. It may also be produced by sea voyages,[§] sexual excitement,[¶] improper indulgence,[**] particular medicines,—as copaiba, cubebs.* It has also resulted from difficult labours and abortions.

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[*] A case illustrative of amenorrhœa, arising from neglect of damp feet during her monthly period, by a young lady, was under my care some time ago. The catamenia were soon restored; but her case was rendered particularly interesting by a peculiar cutaneous eruption, and by the variety and volence of the inflammatory symptoms which appeared during the suppression, as well as by the severity and duration of the hysterical affections which have followed it.

Another case was recently under my care in a young girl, who unfortunately got her feet wet on the second day of her monthly period. She suffered severely at first from a feeling of coldness and sickness. Complete suppression took place on the third day, and was followed by acute pain in the lower part of the abdomen, which required the most active treatment for its removal. The catamenia appeared at the next monthly period, without any emmenagogues being taken.

[†] "Une domestique met en jouant, une clef de fer dans le dos d'une de ses camarades qui avait ses règles. Le sang cesse de couler; il se declare une gastralgie et une leucorrhée que six mois de traitment ne peuvent guerir."—Brierre de Boismont de la Menstruation, page 304.

[‡] A striking example of this came under my observation in the case of a young lady, about eighteen years of age, who was placed in peculiar circumstances, having deserted her home in consequence of having formed an engagement against her parents' consent. She was induced, some weeks afterwards, to join a pic-nic excursion when "unwell;" and after walking about for some time, she sat down in the open air to partake of refreshment. Suppression of the catamenia immediately occurred, and a distressing attack of violent mania followed. She was afterwards taken home by her friends, and I was informed that her health was completely restored.

[‖] Denman, Vol. i., page 187.

[§] I had lately a case of amenorrhœa, which apparently resulted from taking a sea voyage from Aberdeen, in a young girl of delicate constitution, who had gone on board at her monthly period. Suppression of the menses immediately took place, and a troublesome chest affection soon supervened. Both complaints yielded to the treatment pursued.

[¶] "Une servante ayant éte' vivement pressée par un jeune homme dans le temps ses règles, cette evacuation s'arreta," &c.—Boismont, op. cit. p. 319.

[**] Case communicated by Burrows to the Medico-Chirurgical Society, London.

Pathology.—As idiopathic amenorrhœa seldom proves immediately fatal, opportunities of ascertaining the changes of the minute structure of the uterus during suppression are rare, and consequently autopsy of the condition of this organ is very defective, but the toucher and speculum reveal that the cervix is either in a state of congestion or inflammation in the commencement of the disease; and it is very probable this is also the case in the lining membrane; and the symptoms which have been enumerated above fully support this conclusion.

Treatment.—The rules given in a previous part of this paper for the treatment of *delayed menstruation* have anticipated much that is applicable in the treatment of suppression, the same remedies being frequently indicated in both forms of amenorrhœa. It therefore remains in this place to treat principally of those remedial measures which are useful in relieving the acute symptoms of idiopathic amenorrhœa, referring to what has been previously recommended as suitable to the suspended function, when the symptoms have assumed a more chronic character.

I differ from Dr Churchill, who says under this head, that "the first *indication* is, if possible, to recall the discharge,"† because I consider the suppression as a mere symptom, and the anxiety here expressed to restore the discharge, gives a sanction to the adoption of remedies very improper at this period. The great object of treatment in the outset should be to remove or relieve the painful consequences of the disease; and should this be accomplished, the greater will be the prospect of effecting safely the return of the natural secretion either immediately or at the next monthly period. If, therefore, there be no reason to suspect pregnancy, and if the suppression seem to proceed from congestion of the womb, a warm-bath should be ordered, or the hip-bath should be substituted if more convenient, the patient being afterwards put to bed. A linseed poultice should then be applied over the whole abdomen, and repeated in two hours if necessary. The poulticing should be followed by the application of medicated cotton. The functions of the bowels and skin are to be promoted by the exhibition of calomel and antimonial powder followed by castor-oil or other mild purgatives. With this view, five grains of calomel and four of James' powder should be given in the form of powder or pill, as most agreeable to the patient, followed in four or five hours by a full dose of castor-oil, the essence of senna, or Epsom salts, in combination with the tartrate of antimony, to be repeated if necessary so as to effect the free action of the bowels. The patient should have at the same time, warm diluents, as gruel or barley-water, to drink. After the bowels have been moved, the following powder should be prescribed:—

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* Boismont, op. cit. p. 306.

† Op. cit. p. 79.

℞ *Calomelanos*, gr. i.; *Pulv. Jacobi veri*, gr. ii.; *Pulveris Ipecacuanhæ et Opii*, gr. iii. *M. Fiat pulvis, tertia quaque hora sumendus.*

This powder should be continued until the pain in the uterine region and feverishness is removed, care being taken to avoid salivation. During the whole treatment the bowels are to be kept regular by a mild purgative or enemata of soap and water. At this stage of the treatment no stimulating emmenagogues should be administered, otherwise, by unduly exciting the uterus while the system is in an abnormal state, a higher degree of inflammation of that organ may be induced, and the case rendered more unmanageable.

Should these mild means prove unsuccessful, or should the symptoms decidedly indicate a more extensive inflammatory state of the womb, or should the case be complicated with any of the incidental diseases already referred to, as hemorrhage from any of the important organs, profuse leucorrhœa, &c., it will be necessary to have recourse to venesection, or to apply leeches to the lower part of the abdomen, or—what is more beneficial—to the perinæum and vulva. If the patient be married, the leeches should be applied to the womb itself. The *incidental* disease must be counteracted by the usual mode of treatment, modified, of course, by the requirements of the primary disease.

Should the catamenial discharge not appear at the next expected period, the practitioner, having succeeded in removing the attendant symptoms, some of the emmenagogues which I have previously enumerated should be prescribed. The following pills will be found very beneficial.

℞ *Aloes Socotorinæ*, gr. xxxvi.; *Sulph. Ferri; Sulph. Quininæ*, *āā*, gr. xii.; *Mucilag. Acaciæ Arab. q. s. M. Fiat massa in pilulas* xii. *dividenda*, *quarum unam sumat mane et vespere.*

At the same time the patient should have change of air, and take regular gentle exercise every day, on horseback if convenient; but all over-fatigue is to be carefully avoided. If, instead of the natural secretion, leucorrhœa take place, unattended with pain or other indication of chronic inflammation, or congestion of the womb or vagina, it will be necessary to have recourse to injections of the solution of lead or sulphate of zinc, used tepid if cold produce discomfort. If there be pain or much irritation in making water, opium may be added to these injections, or a decoction of conium may be injected with great benefit. Sea-bathing, or the salt water hip-bath, should be used daily. The gallic acid, in doses of three grains in the form of pill, taken three or four times a-day, is very useful in reducing the leucorrhœal discharge when unattended with much irritation.

(*To be continued.*)

APPENDIX TO MR GULLIVER'S PAPER.

Letter from Mr Henry Thompson to Dr Sharpey on the State of the Blood in Animals killed by Lightning. Referred to in p. 368.

Croydon, Surrey,
August 1, 1848.

My Dear Sir,—If I recollect rightly, for I am unfortunately not able here to refer to my notes of Lectures on Physiology, which I had the pleasure of attending last session, you stated that there was still a disputed point regarding the condition of the blood in animals killed by lightning, and recommended students to investigate the question should any opportunity offer.

A few days since, there was a severe thunder-storm in this neighbourhood; and learning that a number of sheep (fifty-two) were killed in an adjoining parish, I went to see them, and obtained permission to examine some. I opened the thorax in five cases, taking out the heart, and ascertaining the state of the blood in it, and in the larger vessels adjacent. In all, distinct coagula existed, which were more or less firm. Both the auricles and ventricles were gorged; and in the latter, the coagula took the form of the cavity to a certain extent, in two instances, showing the fact of their existence to be unquestionable. The examination was made at from thirty to thirty-six hours after death.

I have taken the liberty to transmit a note of the occurrence to you; and trust you will deem it of sufficient interest to warrant my doing so.—I am, my dear Sir, yours very respectfully,

Henry Thompson.

W. Sharpey, Esq. M. D.

PART II.

CRITICAL ANALYSIS.

ART I.—*On the Nature and Treatment of Stomach and Renal Diseases; being an Inquiry into the Connection of Diabetes, Calculus, and other Affections of the Kidney and Bladder, with Indigestion.* By WILLIAM PROUT, M. D., F. R. S., Fellow of the Royal College of Physicians. The Fifth Edition, revised. London, 1848. 8vo, pp. 595.

THE present work, the first edition of which appeared in 1820, was remarkable for being the first, in which accurate chemical knowledge was applied with judgment and ability to elucidate the causes and nature of urinary diseases, and to conduct their treatment on a judicious combination of scientific principles and empirical facts. The author himself, one of the most able cultivators of organic chemistry of the day, showed how far chemical knowledge and chemical theories were applicable, what were the limits which ought to be set to their application, and in what manner the knowledge of chemical actions in the human body is to be combined with that of vital morbid actions, both in explaining the formation of urinary diseases and their cognate maladies, and in regulating treatment. In the last department also, Dr Prout did not confine his views to remedies founded on scientific principles only. But allowing to those, which were in some degree consecrated by experience, a certain degree of worth, he sought to explain their operation on scientific grounds, and approved or rejected them, or marked them with suspicion, according as the experience seemed to be well-founded or open to various sources of fallacy.

The work, composed on these principles and with these objects, has, in the space of twenty-eight years, passed through four editions, the two last with great additions, and all those improvements which the progressive advancement of chemistry during that time has furnished the means of introducing. The first edition, which appeared in 1820, was a sketch or outline of the principal divisions of the subject, traced with the ability, clearness, and neatness which was to be expected from a chemist well versed both in the philosophical principles of organic chemistry, and in the knowledge of the laws which regulate the actions of the animal body. The second edition appeared in 1825, with much of what was given in outline in the first, carefully filled with new and instructive information, and especially on the pathological tendencies of the urinary secretion, and the different characters of the urinary deposits, at different periods of life. Of this a short account was given in 1826, in the twenty-fifth volume of this Journal.*

In 1840 appeared a third edition,† with a much larger amount of new and important information, corresponding indeed to the great and rapid progress made in the lapse of fifteen years in the sciences of physiology and pathology, and especially in the more accurate and just views furnished by organic chemistry. During that time the influence of the organs of digestion upon the urinary secretion had been more carefully observed and was better understood than previously; the extensive and complicated subject of urinary deposits in different states of the system was again by the author subjected to a minute and accurate revision; and a large and important section on the history and pathological relation of albuminous urine, had, if not been opened up and created anew, at least been more completely studied and elucidated.

All these circumstances contributed to effect in the third edition of this work greater and more extensive changes than in either of the two first. Facts, indeed, were so numerous and multiplied that the work was re-written, and presented an appearance almost entirely new. The information was abundant, accurate, and satisfactory; and scarcely another work published during that period can be mentioned as containing a larger amount of new and accurate information on the physiology and pathology of digestion and secretion, on the process of nutrition and assimilation, and the modes and means by which it is liable to become disordered. It is not the smallest praise of this remarkable performance, that while much of the chemical information was new, and many of the views founded on chemical facts were also new, they have endured the test of time and improvement, better than those in any other work with which we are acquainted. The great majority of the doctrines unfolded in the third edition of Dr Prout's work have only been confirmed and corroborated by subsequent researches. The value of the treatise was enhanced by an instructive introductory discourse, in which the author gave a general view of the ultimate composition and structure of organized bodies,—of the nature of the process of assimilation in its primary and secondary stages,—of the composition and properties of the blood,—of the functions of the liver and its secretions, healthy and morbid,—and of the functions of the kidneys and their secretions, healthy and morbid. Scarcely is there any essay more valuable for the instruction which it communicates, in the whole range of modern medical literature, than this introductory discourse. Had this discourse been sufficiently known, and the principles which it unfolds, properly understood among the professed judges of the day, little would have been said and less would have been heard about the alleged discoveries of the professor of Giessen, and the great novelty of the doctrines of that celebrated writer. It is quite clear that the introduction to the third edition of the work of Dr Prout was very little read; that the views which it contains, were almost, if not altogether, overlooked and neglected; and that, had it not been published, the effect with a certain class of readers would have been quite the same.

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* Vol. xxv. p. 327.

† On the Nature and Treatment of Stomach and Urinary Diseases. Being an Inquiry into the Connection of Diabetes, Calculus, and other Affections of the Kidney and Bladder, with Indigestion. By William Prout, M. D., F. R. S., Fellow of the Royal College of Physicians. The Third Edition, much enlarged. London, 1840. 8vo, pp. 483.

In 1843 appeared a fourth edition of this work, in which the principal change was in the general introductory discourse now mentioned, being placed at the close of the volume, where, with suitable additions, it formed a separate book.

Circumstances have concurred to prevent us from giving a formal notice of these two editions, the third and fourth, and of the changes by which they are distinguished; though we have never ceased to embrace every opportunity of placing before the eyes of our readers the doctrines of Dr Prout, and of explaining their merits. The appearance of the fifth edition reminds us that we owe to our readers a duty, the performance of which must be no longer delayed. In performing this duty it is possible that we may in certain points come upon subjects already noticed in the account of the second edition, and elsewhere in this Journal. We do not propose, however, to commit the fault of repetition, which indeed must be less likely, when it is remembered that in the interval twenty-two years have rolled over our heads, and a new generation has arisen around us. The work may in truth be regarded as entirely new since that time.

Distinguishing diseases into FUNCTIONAL, ORGANIC, and MECHANICAL, Dr Prout observes that we rarely find diseases belonging to either of these three great divisions; and as the two last sections in particular are almost always associated in those diseases of assimilation and of secretion which form the chief objects of inquiry in the present volume, he considers the practical part of his subject under two general heads, viz. :—

FUNCTIONAL DISEASES, or those diseases arising from the deranged operations and less obvious lesions of the assimilating and secreting organs; and

MECHANICAL DISEASES, or those arising from obvious lesions of organs, and from the presence of *calculi*, &c. in the bladder.

These two great classes of diseases form the subjects of the first two Books or Parts, into which the practical portion of the treatise is divided.

In a third Book or Part is comprised an OUTLINE of the GENERAL PHYSIOLOGY and PATHOLOGY of Assimilation, and of the SECRETION of the BILE and of the URINE. This third or concluding portion formed, as already stated, in the third edition, the Introduction or Preliminary Discourse.

The first Book or Part, namely that on Functional Diseases, is subdivided into five portions or chapters on the following principles:—

The proximate alimentary principles by which the existence of animals is maintained, though more or less modified by the assimilating processes, are essentially the same as those principles of which animal bodies consist. The processes by which alimentary matters are assimilated in animal bodies are constantly liable to be deranged both in degree and kind; these derangements are manifested by corresponding derangements in the various products secreted from animal bodies by the organs designed for secretion, and particularly by the liver and kidneys; and the relations between the deranged products of secretion and the proximate principles by which animal existence is maintained, and of which animal bodies consist, furnish the means, in many instances, by which we acquire a more correct knowledge of the organ disordered, as well as the nature of the disorders, than can be obtained by any other means.

The proximate alimentary and constituent principles of animals consist of four great classes; namely, the watery; the saccharine; the albuminous or nitrogenous; and the oleaginous classes; and, in conformity with this constitution, Dr Prout considers the pathology of the assimilating processes under four corresponding heads. These are arranged and designated in the following manner.

Chapter I.—General observations on the pathology of aqueous assimilation and secretion.

Section a. Of the relation of the fluids to the assimilating processes in health and in disease.

Section b. Of the relation of fluids to nephritic operations in health and in disease.

Chapter II.—General observations on the pathology of saccharine assimilation and secretion.

Section a. Of saccharine urine. *Diabetes.*

Section b. Of oxalic acid; oxalate of lime.

c. Of lactic acid, &c.

Chapter III.—General observations on the pathology of albuminous assimilation and secretion.

Section a. Of an excess and deficiency of urea.

b. Of albuminous urine.

c. Of lithic acid.

d. Of cystic oxide, &c.

Chapter IV.—General observations on the pathology of oleaginous assimilation and secretion.

Section a. Of excess and deficiency of fat.

b. Of cholesterine and its deposits.

Lastly, Certain mineral matters are liable to be incidentally mingled with the proximate animal principles, and thus to give rise to a class of diseases of considerable importance. These, therefore, are considered in Chapter V., which is, therefore, entitled

Chapter V.—General observations on the pathology of the incidental mineral matters entering into the composition of organized bodies.

I. In the first chapter, on the Pathology of Aqueous Assimilation and Secretion, the chief points deserving notice are the disposition and uses of water when taken into the system, and some observations on the question as to the kind of fluids most suitable to be taken in different states of the stomach and general system, and the period of the nycthemeral revolution most appropriate for the introduction of these fluids.

a. Little doubt can be entertained that water is the most natural and beneficial of all drinks, not only void of harm, but productive of much advantage. Even in large quantity, it interferes less with the functions of the stomach than might be expected; for, by a beautiful provision, the superfluous water is immediately absorbed into the sanguiferous system, or passes downward into the bowels. Of the portion taken into the blood, so much is appropriated as is required to maintain its liquidity, while the excess, if any, is expelled from the system, during summer chiefly by the skin and lungs, and in winter by the kidneys. This escape of superfluous water from the system is rendered subservient to other important purposes. Together with the water, and in solution in it, various effete and noxious matters, the retention of which would prove hurtful to the economy, are removed. Such matters are discharged abundantly by the skin and lungs, though their nature is little understood. Those matters which escape through the kidneys, and constitute the heterogeneous ingredients of the urine, form a principal object of inquiry in the present volume.

It is almost superfluous to observe that this furnishes the explanation of the mode in which one division of the hydropathic treatment operates beneficially,—that, namely, which consists in the copious introduction of cold water into the stomach. From what follows, it will be understood how far this may be beneficial, and under what circumstances it may be detrimental.

Allowing that in the perfectly healthy state of the stomach and system, superfluous water is promptly and easily disposed of, Dr Prout observes, that, in a variety of dyspeptic derangements, this important function is liable to be suspended. The fluids taken then remain in the stomach, and more or less embarrass the digestive functions. The solid food is either imperfectly digested, or is converted into unnatural articles, and the patient is distressed with flatulent distension and various painful symptoms, which frequently do not cease, till the whole are rejected. If not rejected, the half-digested food after a long time escapes into the bowels, deranging their functions, while the fluid portion, loaded with unnatural matters, is absorbed into the system, to be thrown off by the various outlets already mentioned, and particularly by the kidneys, to the great detriment of their functions.

One great cause of all this disorder, and the inconveniences thence resulting, is that, as the fluid remains within the stomach, it dilutes so much the gastric juice, that it renders it quite unable to effect in the alimentary matters the requisite transformations, while, by distending the stomach inordinately, the gastric juice secreted is not in quantity adequate to the contents.

The main practical inference from these considerations is, that individuals subject to gastric derangements should avoid the use of diluents and admixture of fluids, as soups, &c., until the digestive processes are completed. The author adds, that the best time both for such diluents and for the use of alkalies, is two or three hours after the principal meal. A great objection to the use of soda, especially, soon after taking food, is, that as it neutralizes the chlorine or hydrochloric acid of the gastric juice, it must enfeeble greatly the action of that solvent. It is quite clear, indeed, that, if chlorine or hydrochloric acid be the solvent principle of the gastric juice, it was never the intention of nature to put soda into the stomach soon after food has been taken.

Regarding the use of stimulating drinks during meals, Dr Prout thinks it may be laid down as a rule, that the stomach requiring their aid to enable it (in appearance) to perform its duty, is not in a natural state, and must be in some morbid condition. Most of the vinous liquors employed for such purposes contain, besides their common principle, alkohol, various acid and saccharine matters in ill-defined and transition states. They are, indeed, crystallized products. This is the case with most malt liquors, and with wines of the effervescing class, as champaigne, cyder, and similar liquors. Such agents act as ferments the moment they enter the weakened stomach, and are not only converted into acids themselves, but dispose all other articles in the stomach to undergo the same changes. Such liquors the author recommends to be scrupulously avoided, and in their place to be substituted a little sound sherry, which contains less acid and sugar than any other wine,—or a little pure brandy, which contains neither. When the object is to obtain the stimulating properties of these liquors, they should be taken undiluted.

The advice now given is good under the circumstances, that is, supposing that the physician has to do with stomachs that will not do without stimulants, or whose proprietors fancy that they require stimulants. Here, however, it appears to us the good stops. It would be still better to withhold all stimulants, and to give neither sherry nor brandy. When such articles are required, it is clear that the individual eats more than his stomach can digest; it is certain that neither sherry nor brandy facilitate or promote digestion; all that they do is to diminish some of the uneasy sensations which arise in feeble dyspeptic stomachs after taking food. The proper course would be to eat less, and to take those articles only, the digestion of which with simple water gives no uneasiness.

Another practical inference relates to the use of fluid remedies, especially mineral waters. Like pure water, these articles, if taken when the stomach is empty, easily escape from the system by the various outlets, and even by the bowels, provided they be in sufficient quantity and are assisted by exercise. Mineral waters, therefore, are best taken in the morning. As it is further obvious that the advantage of this period consists in the stomach being supposed to have gotten rid of the load of the previous day's work, it may be added, that all mineral waters act most efficiently when the meals are moderate in quantity, rather below than up to the appetite point. Alkaline waters may be taken either in the morning, or preferably, in the evening, some hours after the principal meal, yet so as to allow the greatest part to escape by the kidneys before composing to rest.

The evils resulting from a deficient supply of fluids, and especially of water, are great, and cannot be counteracted by any other means.

b. In speaking of the relation of fluids to renal operations in health and in disease, Dr Prout proposes, instead of the old division of *urina sanguinis* and *urina potus*, to distinguish the former as *urine* of the *blood*, or urine resulting from secondary assimilating processes only; while the latter he considers as the *urine of assimilation*, including the urine resulting from both primary and secondary assimilating processes.

The author thinks that in a state of perfect health there ought to be little difference between the density and the ingredients of urine voided at different times of the day. This abstract perfection, however, is never observed in actual cases; and there are few persons in whom the urine of assimilation does not deviate more or less from the standard of absolute health; and the degree and nature of these differences are the means of throwing considerable light on the derangements of the assimilating organs. The urine of the blood is more uniform in its properties; and whenever that deviates much from its standard qualities, the deviation indicates the presence of disease more or less considerable. The urine, in short, is the great nosometer of the digestive functions and of the kidneys. Several of the most common indications are as follow:—

Copious transparent pale-coloured morning urine denotes usually the presence of formidable derangement. Acidity of the urine, with low density and serousness, denotes, with much certainty, disease of the kidneys. Copious transparent pale-coloured morning urine, with high density, denotes the existence of diabetes. Scanty transparent deep-coloured acid urine usually accompanies continued fever. Scanty, red, turbid, very acid urine, intermittent fevers, gout, rheumatism, &c. A pale-coloured or bright pink-coloured sediment from turbid morning urine, indicates commonly the presence of some deep-seated affection of the chylopoietic viscera, retarding and rendering incomplete the assimilating processes.

The urine voided in the *evening after dinner*, or the urine of assimilation, is subject to much greater variations, both in quantity and quality, than the urine voided in the morning. Even within the limits of what are considered good health, the evening urine is often deep-coloured, above the average density, and during the winter months is apt to become turbid on cooling.

Urine of assimilation above or of the average density, deep-coloured, and serous, indicates the presence of incipient disease of the kidney, congestive or inflammatory. Acid, heavy, serous urine, having, on becoming turbid, the lithate of ammonia partially suspended, denotes the same. Heavy, copious, transparent pale-coloured acid evening urine generally indicates the presence of diabetes. Very light, copious, transparent pale-coloured acid evening urine usually denotes serious disorder, often disease of the kidney. Neutrality of the same urine shows a relative excess of the triple phosphate, or of urea.

II. In the second chapter is considered the pathology of saccharine assimilation and secretion.

a. In the disease named *Diabetes*, the great point is to ascertain how saccharine matter is formed so abundantly as to be present both in the blood and in the urine.

The blood of a perfectly healthy individual contains scarcely an appreciable quantity of sugar, though that article may have formed a portion of his food. The saccharine principle, therefore, must be convertible, the author argues, by the agency of the primary assimilating functions alone, into the constituent principles of the blood. Further, from the relative composition of the saccharine principle, and of the constituent principles of the blood, he argues that it follows, that the faculty of thus converting the saccharine principle must constitute a distinct function; and, as a large proportion of the food of all animals consists of modifications of the saccharine principle, this function must be of the most important kind. If the existence, then, of this function be admitted, it must be admitted also, that, like any other function, the assimilation of the saccharine principle may become deranged or suspended; that is, the primary assimilating organs may become unable to assimilate the saccharine principle.

No doubt can now be entertained that sugar exists in diabetic blood, and that it has been found even in the stomach of diabetic subjects, though sacchariferous articles of food had not been used. Ambrosiani of Milan first, in 1835, announced the fact, that, if diabetic blood is diluted with water and boiled, so as to separate the albumen and hæmatosine, and if the clear liquor is filtered and precipitated by diacetate of lead, and the excess of lead removed by a stream of sulphuretted hydrogen gas, the liquor, when filtered and evaporated to the consistence of syrup, deposits crystals of diabetic sugar.* The same fact was afterwards confirmed by Dr Charles Maitland,† Mr Macgregor of Glasgow,‡ and Dr G. O. Rees of London,§ the last of whom obtained from 1000 grains of diabetic serum 1·8 of a grain of sugar.

From some recent experiments of M. Magendie, it further results that sugar, probably in small quantity, exists in the blood even in health, yet may not appear in the urine. A short account of these experiments is given in the present volume, at page 246; and from these, if they can be trusted, it results that all the liquids of the animal economy, and also warm infusions of brain, heart, and lung, possess the property of converting amylaceous or starchy articles into sugar. M. Magendie accordingly thinks it highly probable that, during the digestion of amylaceous articles of food, the blood contains sugar.

Now, it must be further observed, that starch or *fecula* enters very largely into all the articles of food used by men and animals. All the cereal grains, and the bread made from them, contain more or less amylaceous matter. It is also abundant in potatoes, rice, and various other substances; and if it be less copious in such articles as carrots, turnips, parsnips, these contain, on the other hand, more sugar than the grains do. All these amylaceous articles mostly are, by the aid of the mixed saliva, capable of being reduced and converted into sugar; and if we can trust the experiments of Bouchardat and Sandras, after they have been digested in the stomach, this saccharine transformation is rendered still more complete by the action of the pancreatic fluid. Even bran seems to be convertible into sugar by means of the mixed saliva of the horse.

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* Annali Universali di Medecina, Aprile 1835.

† London Medical Gazette, xvii. p. 900, March 1836.

‡ Ibid. 20, pp. 22 and 268, May 1837.

§ Guy's Hospital Reports, No. vii. October 1838, vol. iv. p. 398.

To explain all this, Dr Prout reasons in the following manner. Dr Prout thinks that the reduction of all the forms of the saccharine principle,—that is, we understand, the digestive conversion of all amylaceous articles of food,—appears to be accompanied by the development of a low sugar; which low sugar, in the healthy state of the organs, is speedily converted into oleaginous, albuminous, and perhaps other matters. As the existence of sugar, therefore, in the stomach is only momentary, its presence in the healthy condition of the organ is with difficulty detected. In diabetes, however, the *reducing* or catalytic function of the stomach is, for the most part, morbidly active, while the *converting* function is more or less suspended or paralysed. In the diabetic stomach accordingly, sugar is found in large quantity, particularly when farinaceous aliments are employed; and from the stomach the sugar readily passes into the sanguiferous system as already stated. The first step in the derangements, therefore, producing the disease diabetes, does not consist, Dr Prout infers, as some have supposed, *in the development of sugar in the stomach, which is a natural process; but in the greater or less destruction of the converting, and consequently of the still more important organizing functions of the assimilating organs.*

In the diseases above mentioned, the function by which the saccharine principle is converted into the constituents of chyle, is suspended or destroyed. In other diseases, however, this function is not destroyed, but erroneously exerted; and the consequence is, that many principles, some of them of a poisonous character—for instance, oxalic acid—are developed from the saccharine principle during the assimilating process. That oxalic acid must be occasionally developed in the system, is evident from the fact, that this acid is found in the urine when it has not been taken into the stomach.

In the healthy state, Dr Prout thinks it probable that sugar never is developed during the secondary assimilating processes. In the advanced stages of diabetes, however, he thinks that there is reason to believe that sugar is not only developed during the conversion of the albuminous principles of the blood into the gelatinous tissues; but also during the secondary assimilation of the gelatinous, and even perhaps of the albuminous and oleaginous tissues. The converting function of the secondary assimilating processes further, like that of the primary assimilating processes, is liable to be erroneously exerted; and unnatural products are in consequence developed in the system. Though of these unnatural products we know less, than of those resulting from the derangement in the primary processes of assimilation, yet Dr Prout thinks that it may, from sundry facts, be probably inferred, that oxalic acid and lactic acid are occasionally included among the unnatural products.

Though it appears, from various facts, that oxalic acid in small quantity occasionally passes through the system, without producing remarkable external symptoms of its presence, yet it is elsewhere shown in the present work, that in many other instances, the presence of oxalic acid in the system is accompanied by certain cutaneous and other diseases more immediately connected with the gelatinous tissues. Dr Prout considers it extremely probable that the development of this acid is one of the derangements of the secondary assimilation of the gelatinous principle.

Lactic acid, in like manner, which is formed in large quantities during rheumatic and hectic fever, he thinks, is developed, not in the stomach, but during certain derangements of the secondary assimilating process.

Dr Prout further thinks, that besides oxalic and lactic acids, other unnatural products of an acid and poisonous character appear to be occasionally developed from the saccharine principle during derangements both of the primary and secondary assimilating functions. He adduces, especially, as examples, the malignant fevers of tropical climates, and even those of our own climate, which arise from miasmata and contagion, as states in which many unknown but pernicious principles are developed from the saccharine radical. The powerful acid of the black vomit, he conjectures, may be either lactic acid or one of a much more injurious character.

In short, Dr Prout argues, that the saccharine principle in nutrition, corresponding with the gelatinous principle in the composition of the animal body, the derangements to which it is liable, and which it actually undergoes, produce in that gelatinous principle the most serious and formidable effects; and, while the vital character of the gelatinous tissues, namely, skin, mucous corion, fascia, aponeurosis, ligament, tendon, periosteum, renders them very liable to be influenced by external causes, their fundamental importance is so great, that to derange or subvert these tissues is in truth to derange and subvert the groundwork of organized beings.

In treating of the causes of this disorder in the assimilation of the saccharine principle, Dr Prout attaches great importance among external exciting causes to cold and moisture, and above all to the influence of malaria or miasma. Though he does not assert that diabetes is a malarial disease, yet a large proportion of the diseases originating in saccharine mal-assimilation, he thinks, must be regarded as proceeding from the influence of this agent. In truth, the production of oxalic acid, of lactic acid, and of abnormal sugar in the animal body, may all be regarded as depending on the same general cause, the influence of malaria on the primary and secondary assimilating processes. This is remarkably illustrated by the effects either of Asiatic cholera on the human body, or the state of atmosphere which favours the production of that disease.

"Every one is acquainted with the familiar fact, that the most frequent and striking morbid appearances presented by the urine from slight causes (such as cold, indigestion, &c.) are the common lateritious sediments. Now, the first circumstances that attracted my notice after the prevalence of the Asiatic cholera, was the disappearance of these sediments from the urine. The absence of these sediments was at first considered to be accidental; but when, day after day, the same occurrence took place, I was induced to inquire attentively into the circumstance, with the view, if possible, of ascertaining the reason. On closer inspection, it was found that the urine of every individual examined, whether in apparent health or otherwise, not only presented the same absence of sediment; but also assumed that peculiar appearance, which I had been accustomed to consider as characteristic of the presence of oxalic acid. As I had always previously found the oxalic acid diathesis of unusual occurrence in London, I was much struck with the phenomenon; and on reflection it occurred to me, that it might be referable to the same unknown cause which was then producing cholera. I was led to this notion from the analogous effects above mentioned produced in the urine by malaria; and also by another curious fact, noticed below,* which likewise took place about the time the Asiatic cholera first made its appearance, viz. a positive increase in the weight of atmospheric air, similar to what might be supposed to be produced by the diffusion of a heavy gaseous principle through the lower regions of the atmosphere. My conclusion therefore was, that the cause of the phenomenon in question, as well as of the cholera, was a poisonous body analogous to malaria, whose high specific gravity and feeble diffusive powers kept it near the earth's surface, along which it insensibly crept, particularly in low and damp situations. Whether this conclusion was legitimate or not, others must decide. I do not think the point worth contesting: but shall briefly mention the following additional facts, connected with the subject.

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* "For some years before the Asiatic cholera appeared in this country, I had been occupied with investigations regarding the atmosphere; and for more than six weeks previously to the actual breaking out of this disease, had almost every day been endeavouring to determine, with the utmost possible accuracy, the weight of a given quantity of air, under precisely the same circumstances of temperature and of pressure. On a particular day, the 9th of February 1832, the positive weight of the air suddenly appeared to rise above the usual standard. As the rise, at the time, was supposed to be the result of some accidental error, or of some derangement in the apparatus employed, in order to discover its cause, the succeeding observations were made with the most rigid scrutiny. But no error or derangement whatever could be detected. On the days immediately following, the weight of the air still continued above the standard, though not quite so high as on the 9th of February, when the change was first noticed. The air retained its augmented weight during the whole time the experiments were carried on, namely, about six weeks longer. The increase of the weight of the air was small, but still decided and real. The method of conducting the experiments was such as not to allow of an error, at least to an amount

"During the prevalence of the above condition of the urine, I likewise noticed, in almost every individual, an unusually acid state of the saliva, and of the cutaneous exhalations; such as I had never, indeed, before noticed, except in the last stages of chronic diseases, or in malarious affections. Besides these circumstances, I also saw, about the time the cholera prevailed, and a little afterwards, more cases of oxalate of lime renal calculi, and of formidable hæmorrhage from the kidneys, &c. than I had ever previously seen during the whole of the long period that urinary diseases had occupied my attention. As the cholera disappeared, the above state of things gradually subsided; but I have sometimes imagined that the urine has never completely recovered its former condition. Indeed, during the winter and spring of 1837 and 1838 lithic acid deposits were comparatively rare in London; and the urine assumed much the same appearance as during the prevalence of cholera, though in a less marked degree."—Pp. 20–22.

Among remote causes referable to diet, Dr Prout specifies the use of sorrel in France, and rhubarb stalks in this country, as highly injurious.

In certain districts of France, where sorrel is much used, oxalate of lime calculi are very frequent. In this country also the author has observed oxalate of lime nephritic calculus repeatedly to follow the free use of the rhubarb stalks as an article of food.

In the case of unwholesome diet, and especially in seasons of scarcity, the mal-assimilation of the saccharine principle is effected in a peculiar way. The saccharine principle of the grain is either deficient in quantity or imperfectly developed. The consequence is that, like the oxalic acid in the case of sorrel and rhubarb, the poison is taken ready formed with the food itself. The same remarks apply to food consisting of damaged and putrescent animal matters.

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so great as the additional weight, without the cause of the error having become apparent. About the 9th of February, the wind in London, which had previously been west, veered round to the east, and remained pretty steadily in that quarter till the end of the month. Now, precisely on the change of the wind the first cases of epidemic cholera were reported in London, and from that time the disease continued to spread."—See my Bridgewater Treatise, page 351.

Dr Prout equally condemns, as interfering with the assimilation of the saccharine principle, the habitual use of tobacco. But of all these agents it may be said that, while the strong and robust are little affected by them, those of delicate and feeble organization suffer much and seriously.

After these remarks, as introductory and illustrative, the author enters on the express examination of diabetes, which he defines to be a disease in which a *saccharine state of the urine* is the characteristic symptom.

It is unnecessary to follow the author in his detailed account of the symptoms of this disease. It is sufficient to advert to a few leading facts.

Though a saccharine state of the urine be the pathognomonic character of this disease, and though it might be inferred, and has been sometimes said, that the sugar is formed at the expense of the urea, yet the urea does not entirely disappear. Dr Prout never met with a specimen of diabetic urine entirely void of urea. In some instances it is in larger proportion than natural. It has been known to contain blood, and in certain cases chyle. Diuresis is a symptom almost constant, and exists in every degree. It seems doubtful, nevertheless, whether the materials thus carried out of the system are ever so much as double the *ingesta*. Occasionally, but not always, the *egesta* exceed.

Persons labouring under diabetes are liable to have the thread of life suddenly snapped by unusual efforts. Thus the fatigue of travelling has been repeatedly observed to accelerate the fatal termination. Dr Prout states, that within the last few years, not fewer than four individuals died from the fatigue and excitement incidental to a journey from the country to consult him. The first was a gentleman from the Channel Islands, who, having suffered much from cold and sea-sickness during a tempestuous voyage, died the next morning after he came to town. A second gentleman died before he was seen, almost immediately on his arrival at the house of a friend. A third very nearly died in the house of Dr Prout; and though he rallied so far as to be able to mention the abode of his friends, and was conveyed thither with every care, he died within a few hours. A fourth gentleman recently died soon after his arrival at home, apparently in consequence of the excitement of his journey to London. In all these different cases the individuals were in their ordinary state of health when they left home; and their deaths could be only ascribed to the fatigue consequent on travelling. Dr Prout therefore cautions diabetic patients against taking long journeys or otherwise fatiguing themselves, particularly in very hot or very cold weather. The general prognosis in the established disease must therefore be considered as unfavourable.

Diabetes is peculiar to the human race. Horses and other animals are subject to diseases, accompanied by a large flow of urine; but in such cases the urine is not saccharine.

Most frequently the disposition to the disease is hereditary; and usually it runs in different members of the same family. It rarely occurs in young persons, except under that form first described by Dr Venables. Dr Prout saw an instance of the disease in a girl of five years old, in whom it ran its course rapidly, and proved fatal in a few weeks. This seems to be the only instance of the disease which he witnessed at so early a period.

Diabetes accompanies or precedes affections of the skin, and of the cellular tissue; and boils and carbuncles are not unusual as its precursors or accompaniments. When the diabetic disorder is established, the cutaneous eruption disappears. When the carbuncular inflammation and suppuration are present, the urine is saccharine.

The disease may exist for many years in the incipient stages. But when it is established, its course is in general rapid, and its duration not lengthened.

Morbid anatomy has never thrown much light on the nature of diabetes. In different instances different organs have been found affected with morbid changes; while in other instances scarcely one trace of disease has been found in any organ. The lungs are the organs in the greatest number of cases presenting indications of disease. Next to these come the liver, the mesenteric glands, the prostate gland and bladder, and the kidneys, one or both of which may be in a state of organic disease; while in other individuals each and all of these organs have been observed to be apparently sound. From such diversity in the organs affected, and particularly the occasional absence of all organic disease, Dr Prout thinks it probable that the presence of sugar in the system, neither necessarily depends on, nor produces, visible organic lesion of any particular organ; but that organic diseases, when they exist, are merely concurrent affections. This inference is rendered more probable by the fact, that in diabetes sugar is constantly passing through the sanguiferous system without producing any very striking disturbance. This peculiarity Dr Prout is disposed to ascribe to the mild and innoxious character of the saccharine principle, and to its great solubility in water. He thinks, that if sugar possessed active properties, or were as insoluble as the albuminous principle, it could scarcely be doubted that the constitutional disturbance produced would be much greater, and that organic disease would be a more frequent consequence of its presence in the blood.

In this matter Dr Prout is certainly our best guide; and every one must willingly adopt his views. But though we agree that one of his inferences,—that regarding the absence of organic disease as an effect of saccharine impregnation,—is well-founded, we are not quite so willing to assent to the correctness of the other, that, namely, regarding the innoxious and harmless character of saccharine impregnation of the blood, and the small amount of constitutional disturbance which it induces. Assuredly that substance cannot be said to be mild and innoxious in action, which irritates the stomach so as to create incessant thirst and frequently-recurring hunger; which irritates the kidneys so much as to make them discharge unusually large quantities of fluid; and which finally irritates by its presence all the textures to such a degree as to wear down the frame of the patient, and bring him, in the course of a few months, to the tomb. Neither can we understand what is meant by saying, that the presence of sugar in the circulation does not produce any very striking disturbance. It may not produce constitutional disorder like fever, or pneumonia, or *phlebitis*, but it produces so much that it wastes the body of the patient, and, notwithstanding the use of the most nutritious articles of food, enfeebles him until he is no longer able to move. We must, therefore, continue to think that the presence of sugar in the blood to so great amount as it is found in diabetes, acts as an irritant poison, though a chronic one in its operation, and that the disturbance which it produces is always of a most serious and fatal character.

In considering the means of treatment, Dr Prout justly observes that practically diabetes ought to be viewed in a twofold light; first as a simple saccharine condition of the urine, without increase in quantity; and secondly, as complicated with an excessive flow of that secretion. Probably the first point, as the foundation of a distinct indication, might be rendered more comprehensive without diminishing its practical character, by stating that the disease consists in a saccharine condition of the blood, and a sacchariferous state of the assimilating organs. He seems to think that there are no known means of improving the qualities of the urine, and that the only mode of accomplishing such an object is by the use of agents which tend to diminish the quantity of the urine, and to restore the general health. This mode of reasoning may be what is called practical; and again we desire to defer to the authority of a chemical pathologist so skilful. Yet it is scarcely consistent with the reasoning and theoretical principles laid down in the previous part of this chapter. The mind of the reader is there distinctly and forcibly directed to the derangements in primary and secondary assimilation, as the main cause of evil in diabetes; and accordingly it might appear a more consistent doctrine to say, that it was of primary importance, in attempting to cure the disease, to rectify and remove these derangements, and thereby to rectify the state of the urine.

In the application of his views in detail, we are pleased to observe, that to them no objection can be made.

Though the author allows that an animal diet ought to form an essential principle in the treatment, he nevertheless approves not of a diet exclusively animal, and allows that a certain proportion of vegetable matters may be proper. The vegetable matters which he particularly recommends are the green portions of plants. Farinaceous articles he prohibits entirely in the confirmed stages of diabetes; but, as the disease recedes, he thinks it proper to introduce gradually the use of these substances. The recommendation of this admixture of farinaceous articles is founded on the fact, apparently well established, namely, that the assimilation of the saccharine principle is one of the last functions that becomes extinct in animals. Of farinaceous articles, the high or strong, as the flour of wheat, in the shape of unfermented bread or biscuits, appear to be most easily assimilated. The low kinds of farinaceous articles, as arrow-root, potatoes, and similar substances, with the exception of rice, seem to be more easily reduced to sugar than the flour of wheat, and, in general, therefore should be avoided. Every variety of the saccharine principle in its crystallizable form is absolutely inadmissible as an article of food in diabetes. This rule excludes, therefore, all fruits, whether subacid or sweet, as well as every compound, natural or artificial, into which sugar enters.

Oleaginous matters are often useful, not merely in allaying thirst, but in satisfying the cravings of appetite, and in giving a sense of comfort and support to the stomach, while they are not readily convertible into sugar; and where they do not otherwise disagree, they may be taken in considerable amount. Butter appears to be the most agreeable form.

Gum, which is not so readily convertible into sugar or oxalic acid as farinaceous matters, Dr Prout thinks, might be employed as an alimentary article. But on the effects of this article, he acknowledges that he is unable to speak satisfactorily.

It is, however, as important to attend to the amount of diet in diabetes as to its quality. It is well known that the keenness of the appetite, and the oft-recurring sense of hunger, have led many practitioners to allow large quantities of food; and these permissions patients are very willing to carry to great lengths. The practice, nevertheless, is not good, and is very far from being void of danger.

The greater number of cases of sudden death have been distinctly referable to errors either in the quality or the quantity of food, or to both; that is, the patient has been usually cut off after a hearty meal, as it is commonly termed. Dr Prout recommends, that to avoid these evils, a quantity greater or less, according to circumstances, but always strictly regulated, should be taken at periods of four, five, or six hours; and that at the time of taking solid food, and for one or two hours afterwards, fluids should be abstained from as much as possible. The particular articles permitted are mutton or beef plainly dressed, particularly mutton chops or beef steaks rather underdone, which may be taken twice in twenty-four hours; while other meals should consist of any simple article that can be prepared from milk, eggs, butter, &c. The recommendation of this plan of solid diet is chiefly founded on the fact, that the reducing or dissolving function of the stomach is unimpaired or morbidly active in diabetes. When the reducing function is impaired, as in a few instances happens, a system of diet less solid, and consisting of animal matters reduced to the pulpy state by stewing after the French fashion, becomes more appropriate.

The management of drink is perhaps more difficult than that of food. The Bristol Hotwell and other waters, containing in solution carbonate of lime, and which have long enjoyed celebrity in diabetic affections, Dr Prout allows to be beneficial; and, upon the same principle, he recommends waters artificially impregnated with lime or magnesia, the latter suspended by means of carbonic acid gas. The alkalies and their salts are too diuretic to be employed; but, when combined with carbonic acid, they are often useful in allaying thirst. Distilled water he thinks the best simple diluent. Porter is preferable to wine or spirits, in the case of those persons who have been accustomed to use fermented liquors. Porter he regards as more easily assimilated than ale, especially the sweet ales; but he allows that the highly-hopped finer Burton ale may be unobjectionable, both in dyspeptic cases generally, and in diabetic cases. All drinks for diabetic symptoms should be taken tepid.

Dr Prout next treats of aliments containing matters incapable of being assimilated, and intended only for excremental purposes. On this subject the observations are interesting.

Excremental matters he classes under three heads; first, matters incapable, under any circumstances, of being assimilated; secondly, matters capable of being assimilated, but which, on account of some derangement in the system, are only partially or imperfectly assimilated; and, thirdly, superfluous alimentary matters, not required at all by the economy, and therefore not assimilated.

First, regarding matters incapable of being assimilated,—under this head are included only those matters which usually form a natural constituent of common aliment; for instance, the principle termed *lignin*, including the coverings of the seeds of the *cerealia*, and the green colouring matter of the leaves of plants in all their numerous forms and varieties among vegetable aliments, and, among animal aliments, the cartilaginous and incidental mineral matters.

In those forms of dyspepsia, and especially in diabetes, in which the reducing powers of the stomach are morbidly active, so that every soluble substance is immediately acted on, and withdrawn from the alimentary canal, the bowels are apt to become unusually torpid, unless there be taken with the food a certain proportion of matters incapable of solution, but which, while they gently stimulate, do not over-excite, or otherwise derange the functions of the alimentary canal. Among matters suited for this purpose, the author regards none as superior to the vegetable proximate aliment termed *lignin*, a modification of the saccharine principle, which, though readily dissolved by the stomachs of some of the inferior tribes of animals, resists in general, in all its forms, the powers of the human stomach. Of the multiplied shapes assumed by *lignin*, the best adapted for excremental purposes is that of the external covering of the seeds of the *cerealia*, particularly wheat. Bread, therefore, made with unboulted flour, or even with an extra quantity of bran, is the most eligible form in which farinaceous and excremental matters can be usually taken in most of the forms of dyspepsia, accompanied by constipation. Bread formed in this manner is, as we have shown on former occasions, not only more economical, but much more salubrious than that formed from fine boulted and screened flour; and were it used, it might not only obviate many disorders, but would certainly alleviate those in which constipation and torpor of the bowels is a leading character.

The only rational objection to the universal use of bran-bread, and bread prepared from whole wheat meal, is that, with some perhaps it may act as a mechanical irritant of the alimentary mucous membrane. Such cases, therefore, must be regarded as exceptions to the use of lignin. In a few of these cases the green matter of plants is found to be more suitable. Another objection to this article is that it sometimes produces acidity and flatulence. But where it does not, it is most likely to act beneficially in maintaining a moderately loose state of the bowels.

Other excremental matters, consisting chiefly of modifications of the lignin principle, are the fibrous or membranous coverings of many seeds and fruits, as of the grape, apple, gooseberry, &c., all of which are insoluble, and contribute by their mechanical stimulus to promote the action of the bowels. On the same principle the author thinks the mustard seeds, once so strongly recommended, and so generally used, act; though he allows that in this case the stimulating properties of the mustard may have contributed to the effects produced.

Among animal substances employed as aliments, the tendinous and cartilaginous fibres and membranes form the chief of organized excremental matters. These substances are capable of being acted on to considerable extent, when the reducing energies of the stomach are strong, as in cases of unusual abstinence and starvation; but under the ordinary circumstances of satiety in which mankind in a state of civilization live, such matters escape solution entirely, and consequently pass off as excremental matters. Viewed in this light, however, they must be regarded as vastly inferior to the lignin principle. The same remarks apply to bones, which are devoured as food by carnivorous animals. The incidental mineral matters are in so small proportion, that of them it is unnecessary to speak.

The second great class of excremental matters, those, namely, capable of being assimilated, but which, from defects in the digestive processes, are only partially and imperfectly assimilated, requires few remarks; and these may be made as applicable to the third class, namely, superfluous alimentary matters.

A stomach habitually weakened from any cause, but especially from overwork, when oppressed with superfluous aliments, selects for its operations those matters most easily assimilated, while the residue are either partially or in no way touched. In such circumstances, the little changed or the unchanged matters become excremental, producing more or less derangement in the alimentary canal, especially in the functions of the cæcum and colon. If the stomach be active, and perform its portion of duty vigorously, the superfluous matters are more or less assimilated, and their products pass into the circulating system, producing there more or less plethora; while the upper parts of the alimentary being kept constantly supplied with alimentary articles, a state of distension highly unfavourable to regular circulation and secretion is induced. The vessels become compressed, and the circulation through them is obstructed; and what was at first mere mechanical distension, becomes eventually vascular congestion and obstruction. Not only is the vascular system of the whole upper part of the alimentary canal thus congested and obstructed, but the disorder extends to the liver, spleen, pancreas, and contiguous organs. This state is removed at intervals by the use of purgative medicines, or by spontaneous diarrhœa; but very often it lays the foundation of that derangement in the assimilating organs, which paves the way for, and terminates in, the formation of lithic acid, lactic acid, and similar products, causing gout, gravel, and rheumatism. If the bowels be passive, or neither irritable nor sluggish, as is often the case in strumous individuals of middle age, unassimilated matters pass off almost in unlimited quantities, without causing inconvenience. Such persons eat enormously, and this they require to do in order to enable them to subsist.

Applying the principles now stated to the treatment both of dyspeptic disorder and of diabetes, it is of the utmost importance to regulate the quantity as well as the quality of the diet in such manner that the food may be fully assimilated. It is always indispensable to remember, that it is not what the individual eats, but what he assimilates, that gives strength and really supports his system. In the same manner, in the treatment of diabetes, the object is to regulate the diet in such manner that the food may be properly assimilated, while the urine is improved in quality and diminished in amount. The particular application of these principles to particular cases and complications, Dr Prout recommends to be regulated by the views he delivers on the strictly medical treatment.

Blood-letting is requisite only in the early and incipient stages of the disease. Local blood-letting, by means of leeches applied to the epigastric region, is often of use in the course of the disease.

Purgatives are almost indispensable, but merely to regulate the action of the bowels. The best is olive-oil or castor-oil; and next to these rhubarb. The saline purgatives, excepting only the phosphate of soda, are inadmissible.

Remedies acting on the skin are still not less strongly and clearly indicated. Flannel-clothing, friction with the flesh-brush, the warm-bath or vapour-bath, are the most efficient. The usual internal diaphoretic remedies are recommended.

Among sedatives, astringents, and tonics, the author says that he prefers super-sulphate of quinine or of iron, doing with as little opium as possible.

Among antacids, which are sometimes indicated, especially where lithic acid is deposited, magnesia is one of the best, given in doses of from fifteen to thirty grains two or three hours after breakfast and after dinner. Ammonia and its salts, especially the citrate and acetate, either alone or with the salts of iron, are in many cases very beneficial.

Mercury, we have formerly mentioned, always exerts an injurious influence on this disease, and should never be administered except with the greatest caution. Its exhibition, indeed, in almost all cases of deranged or imperfect assimilation, is hurtful. Dr Prout allowing that, in the majority of cases, it is most pernicious, thinks that its use in diabetes, when indicated, should be limited to the following three cases or complications: first, general inflammatory or phlogistic fever; secondly, acute or chronic inflammation of the liver; and, thirdly, the temporary congestion liable to occur in those individuals who have been long accustomed to the stimulus of mercury.

On the employment of mercury, and the probability of its proving beneficial in each of these forms of disease, complicating diabetes, the author makes appropriate remarks. But the general result of his observations is, that the exhibition of mercury is at best always an ambiguous measure, and often one pregnant with extreme mischief.

Next follows an account of diuresis and diabetes as they take place in children.

In young children, as in adults, diuresis is a symptom of different forms of disease. In all these diseases, the urine is not only excessive in quantity, but more or less unnatural. In infantile *diuresis*, the urine may be albuminous; it may present an excess or deficiency of urea; or it may contain saccharine matter, either alone, or in conjunction with albumen or a large proportion of urea, or even other unnatural ingredients.

All the forms of diuresis, as they usually appear in young children, commence soon after weaning. The child becomes dull, heavy, and spiritless, loses flesh, has dry harsh skin, irregular bowels with prominent belly, and quick irritable pulse. The urine is in general scanty and high-coloured; becomes turbid immediately on cooling; and there falls a pale clay-coloured deposite of lithate of ammonia, sometimes intermixed with oxalate of lime, or the phosphates. As the disease advances, the quantity of urine rapidly increases. The density varies from 1010 to 1025; and on examination it is found to contain a great excess of urea, and occasionally traces of albumen and sugar.

If the disease be neglected or mistreated, it usually terminates in organic lesion of the kidneys, accompanied with deficiency of urea, and the presence of albuminous matter in the urine; or occasionally it terminates in diabetes. These form two different phases of disease.

In infantile diuresis with deficiency of urea, the symptoms may proceed for a considerable time, and cut off the patient by coma or infantile convulsions. In infantile diabetes, the symptoms may continue longer, and terminate life by exhaustion.

Both diseases, which are probably allied, occur mostly in the children of strumous persons who are at the same time dyspeptic and gouty. They are most frequently seen in large towns, in small confined ill-aired houses, among the children of profligate artisans and needy ill-fed families, where bad air, bad food, and neglect of cleanliness combine to impair the health at that early period of life. The mothers are often gin drinkers or spirit drinkers; and it is not improbable that the spirituoüs impregnation of the milk may have contributed to predispose to the disease.

The treatment consists in removing the child into a situation provided with pure dry air, warm if possible, the use of the hot-bath with warm clothing, good nutritious food, not in excess, consisting of albuminous and farinaceous articles, with due management of the bowels and of the skin. Blue phosphate of iron is recommended by Dr Venables; and this or the tartrate, citrate, or carbonate of iron, or the ammoniated tincture, the author allows to be very beneficial.

b. Next comes the consideration of the oxalic acid diathesis.

When the formation of oxalic acid is predominant in the system, the urine is generally transparent and free from sediments, of a pale citron-yellow or greenish hue, and of moderate density, that is, oscillating about 1020 as a mean point, but often below this,—a circumstance dependent on variations in the quantity of urine secreted, which is frequently above the healthy standard. Urine containing oxalic acid seldom contains sugar; yet the author has seen a few instances in which the two unnatural products not only co-existed, but appeared to pass into each other. In other words, sugar gave place to oxalate of lime, and, conversely, oxalate of lime gave place to sugar.

The most certain and effectual method of deciding on the presence of the oxalic acid diathesis is by the use of the microscope, by which the observer is enabled to distinguish the crystals of oxalate of lime in the urine, or deposited from it in the form of flat octahedrons, double superposed cubes, and crystals shaped like a dumb-bell or double-headed shot.

The symptoms connected with the oxalic acid diathesis belong to the irritable or nervous class rather than to the congestive or inflammatory. The stomach is oppressed with flatulence, especially when empty, and the gaseous matters extricated contain an unusual proportion of azote. With this are associated irregular action of the heart and intermission of the pulse. The reducing function of the stomach is much less active than in diabetes; but there is great craving for food, which, so far as the stomach is concerned, appears to be readily disposed of, and without producing that distress so frequently caused by solid matters, when the reducing function of the stomach is weak. The region of the stomach is occasionally the seat of pain on pressure, and this tenderness is sometimes accompanied by a sense of heat, and in a few instances by severe gastrodynia. Yet these symptoms are less frequent than in other forms of dyspepsia. The sufferers from this form of dyspepsia have generally less desire for solid food than for vegetable matter, and frequently they evince a strong propensity for sweet articles, especially sugar and saccharine compounds.

At a certain period after eating, longer or shorter according to circumstances, a sense of uneasiness is felt, arising from flatulent distension of the duodenum, and which by degrees is propagated to the region of the cæcum. During this time the patient feels most uncomfortable. The bowels are capricious and irregular, in consequence of irregularity in the secretion of the bile, which is either deficient or excessive. The colour of the bile varies, being sometimes greenish, at other times orange-red or chocolate-brown, at other times almost black. Periodical discharges of dark-coloured blood are liable to take place from the bladder and rectum, especially in persons of swarthy complexion.

The constitutional symptoms vary in degree and character. Cutaneous eruptions are not uncommon, and their presence appears to relieve the internal distress. Sometimes the symptoms wear the desponding and hypochondriacal character; and the patient, though having sufficient real cause of complaint, is liable to add to his sufferings by fixing his attention on those which either have no existence, or which are not the true sources of his distress.

In extreme cases oxalate of lime is consolidated into a concretion within the kidney, and may either cause pain or not. In the former case it directs the attention of the patient to the urinary organs. A calculus may escape, and after its discharge the patient sometimes recovers health and preserves it for years.

Hemorrhage from the kidneys is believed by the author to be more frequently produced by the oxalate of lime calculus than by any other concretion. Dr Prout adds, in illustration of the fact formerly stated, as to the influence of derangements in the assimilating organs in producing this species of calculus, that more cases of hemorrhage from the urinary organs occurred to him during the season (1833) following the prevalence of cholera in this country, than he had ever seen before that time.

When much saccharine matter is consumed as food by dyspeptic individuals, especially in cold climates, the urine may contain sugar as well as oxalic acid; and when sugar, and particularly oxalic acid, are thus freely taken, as by those who use rhubarb frequently as an article of food, the urinary sediments always contain more or less of the oxalate of lime. The oxalic acid diathesis may also be associated, especially in young persons, with serous urine.

Lastly, it is to be remembered, that though the oxalic acid diathesis prevails in hundreds of individuals, yet a few only suffer from calculus. Dr Prout thinks that the formation of the mulberry calculus depends in general on accidental circumstances, either the presence of a foreign body, or some local inflammatory action of the kidney.

The causes of this diathesis are not always easily recognized. The author mentions, as usual, the hereditary disposition, and a syphilitic taint; then considers temperaments; mentions the character of light or reddish hair; a dry irritable skin; with a tendency to impetiginous affections or some allied cutaneous disorder.

The periods of life most subject are those between two and twenty-four years, and forty and sixty-five years of age.

Malaria and residence in miasmatic districts he regards as the most certain and prolific cause of the disorder. Yet the diathesis is not liable, like that to diabetes, to be excited by mere exposure to cold, or an attack of gout, or of acute rheumatism. This form of concretion, however, is often accompanied by chronic rheumatism, and occasionally it follows an attack of gout. Diet he regards as, above all, the most powerful exciting cause in habits strongly disposed to the disease. The abuse or excessive use of sugar, and the free use of rhubarb, he has equally seen followed by the formation of the mulberry calculus. Among other exciting causes, in certain habits, the author mentions loss of blood, excessive venereal indulgences, and the depressing passions, especially grief.

The presence of oxalic acid in the system, which is the great circumstance on which all the others depend, arises from one of two causes, which, for want of a better name, he denominates *proximate causes.* These are, first, the non-assimilation of oxalic acid taken as food; and second, the mal-assimilation of saccharine aliments, and extreme cases perhaps of albuminous and oleaginous aliments. The first cause, it is clear, must have but a limited and narrow operation; for oxalic acid is very rarely taken as food to any great extent; and few there are even in this country who make much use of rhubarb, in which it is found in the form of super-oxalate of potass. The author allows also that there is reason to believe that the perfectly healthy stomach can convert small quantities of oxalic acid when mixed with articles of food. Yet no one in his senses would choose to put the stomach habitually to this test, by taking what is known in the pure state to be a very active and rapidly-acting irritant poison.

The second cause, therefore, must be the great and most generally efficient one;—the mal-assimilation of saccharine aliments, and in certain cases of albuminous and oleaginous aliments. Under the head of saccharine aliments are here included all amylaceous articles of food, all articles in short which, containing starch, are liable to be converted either into dextrine, or glycose, or sugar. As this embraces a large list of articles, and includes also all those into the composition of which sugar pure or impure is made to enter, it is not difficult to understand how, if this converting faculty of the system be inactive, perverted, or otherwise deranged, oxalic acid may or must be formed. As for this purpose nitric acid, there is reason to believe, is required, it seems reasonable to infer that the albuminous or nitrogenous articles of food must undergo some resolution; and that the nitrogen separated from or furnished by them at the moment of decomposition being presented in the requisite proportions to the oxygen of the amylaceous and saccharine articles, forms nitric acid sufficient to convert the residual elements of the sugar into oxalic acid; or, in short, that the elements of the amylaceous and albuminous matters are, in the process of decomposition or catalysis, so arranged that oxalic acid is formed, instead of those products which in the healthy state proceed from saccharine or amylaceous and albuminous articles.

Oleaginous articles may be viewed in the same light as amylaceous in accounting for this formation of oxalic acid.

The readers of this Journal are aware that a mode, a little different, of explaining the formation of oxalic acid within the human body, is given by Dr Golding Bird.* That author, while he regards as inadmissible the theory that oxalic acid is formed from the saccharine matter of the food, believes that there is reason to think that oxalic acid is formed from uric acid by the latter entering into new arrangements. His reasons for this may be found in the proper place;* and we therefore dwell no longer on the subject, than merely to observe, that after all, probably the difference between the two views is not so considerable as may at first sight be imagined. Both authors agree in admitting a very serious disorder in the primary and secondary assimilating functions; and for all practical purposes this is probably sufficient.

In treating the oxalic acid diathesis, Dr Prout recommends that diet should be the great medium of curative measures; that the patient should carefully abstain from all saccharine articles of food, and particularly from sugar; that his diet should consist chiefly of animal matters, and the stronger farinaceous articles; that the low farinaceous articles which contain starchy principles should be avoided; that, as the reducing function of the stomach is more or less impaired, food should be dressed mostly on the French system, in which they are reduced to the pulpy or semifluid state, or the comminuted form; that fermented liquors ought as much as possible to be abstained from; that diluted brandy is preferable to wine of any kind; and that distilled water, or the purest that can be got, alone, and free from lime, is the safest.

As to mere medical treatment, that given under the head of diabetes will in general answer. The mineral acids Dr Prout thinks beneficial; but their effects require to be watched, as they produce a deposit of lithate of ammonia or lithic acid; and he recommends that the nitro-muriatic acid be taken in distilled water, and continued till the lithate of ammonia or lithic acid begins to appear in the urine, or for the space of one month. This course of mineral acids repeated three or four times in the course of one year, with careful regulation of the diet, the author has several times witnessed remove the diathesis entirely. In the intervals between the use of the nitro-muriatic acid, tonics, as the sulphate of quinine or zinc, the trisnitrate of bismuth, the oxide of silver, and similar agents may be employed.

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* Edinburgh Medical and Surgical Journal, vol. lxix. p. 154. January 1848.

The best means of relieving the uneasy feelings arising from irregular cardiac action and intermitting pulse are the use of hydrocyanic acid, either alone or with tincture of foxglove.

Of the effects of mercury the author speaks in the same terms as when treating of the use of that mineral in the management of diabetes.

An event which occasionally is observed to take place is, that the oxalate of lime diathesis passes under certain circumstances into the phosphatic. It is afterwards shown that the formation of the phosphates is much more frequently an induced than an original malady; and that the phosphatic diathesis is generally the consequence of some local disease or irritation in the urinary organs, and thus becomes as it were the point towards which all the other diatheses converge.

During the transition from the oxalate of lime to the phosphatic diathesis, it appears from the section of calculi, and from the phenomena presented by the urine, that one of the first changes is the secretion of an excess of carbonate of lime, and that, as the quantity of lime is increased, the proportion of oxalic acid is diminished, while that of phosphoric acid is increased, until at length phosphate of lime nearly pure is deposited. The urine during these changes frequently deposits the triple phosphate; but according to the observation of the author, the deposition of this salt is much less abundant than during the transition from the lithic to the phosphatic diathesis. As the changes proceed, the urine assumes all the properties of phosphatized urine; though to the last, in adults, the phosphate of lime occasionally predominates over the triple phosphate.

In children, the oxalate of lime, during its transition to the phosphates, is often accompanied by a portion of pale clay-coloured or nearly white lithate of ammonia; as well as by the triple phosphate of magnesia and ammonia.

The general symptoms resemble those which attend the oxalic acid diathesis; but they are attended with more decided marks of local as well as general irritation. This character must be kept in view in treatment.

c. The third section of chapter second is devoted to the examination of the lactic acid diathesis.

Lactic acid and its near relative acetic acid are alike developed from the Saccharine and Albuminous, that is, the Gelatinous form of the Albuminous principles. The consideration of the phenomena attending the development of these acids forms a proper link between the saccharine and the albuminous derangements. These, therefore, Dr Prout considers together; and along with these the muriatic acid and other acid principles, as carbonic and butyric acid, usually developed in conjunction with the lactic acid during the assimilating processes.

Lactic acid and similar acid agents may be developed either during the primary or the secondary assimilating processes; that is, either in the stomach and other parts of the alimentary canal, or within the vascular system.

The acids found in the stomach are derived from two sources: from the blood circulating in the vessels supplying the stomach, or from changes occurring in the matters secreted by these vessels; and from the alimentary matters received into that organ. The lactic and muriatic acids are principally derived from the blood and from the matters secreted or introduced into the stomach; while the oxalic, butyric, acetic, carbonic, and perhaps in some cases the lactic acids, are developed from the food during imperfect assimilation; which imperfect assimilation is often a concomitant process attending the abnormal development of the lactic and muriatic acids. In cases of severe dyspepsia, accompanied by intense acidity, the acids present have probably a twofold origin; though their development from the blood, or from matters derived from the blood, rather than from the food, may be considered as furnishing the index of the disease to be combated.

It is well known that Dr Prout was among the first who showed, in 1823, that muriatic acid is always present in the stomach during digestion; and that in all probability it constitutes an element in the gastric fluid or that particular secretion necessary to digestion.* In the fact of muriatic acid being present in the stomach during digestion, his conclusions were confirmed by the researches of Children; and though this has been controverted, and it has been rather confidently denied, that muriatic acid is secreted by the stomach, the opponents maintaining, that it is obtained from the salt taken with the food,—yet all this seems doubtful, and the original statement of Dr Prout appears to be founded on fact. In the third part of the present volume the author shows that muriatic and lactic acids are always present in the stomach during the reducing process, and that their presence, in some peculiar form of combination, appears to be requisite to the accomplishment of that process. It is therefore the abnormal presence only of these acids, and particularly those circumstances which determine the presence of one acid rather than another, that are now to be considered; for though both acids may be in excess, one always predominates.

The difficulty of the inquiry is not disguised by Dr Prout. But the following statement embraces the principal known facts.

The predominance of muriatic acid seems in general to denote the presence of a phlogistic or inflammatory state of the system; while the predominance of lactic acid indicates rather a state of irritation. This is the general law; but to this there are many exceptions; and the two orders of phenomena are so blended with each other, that to draw between them a precise line is impossible. In illustration of the subject, the author states that in the dyspepsia of plethoric gouty individuals he generally found muriatic acid predominant, as also in what are called bilious attacks and fits attendant on gall-stones in the same class of persons. Though in these and similar instances the stomach may be primarily affected, yet commonly it is affected by sympathy only with some distant organ. Thus in bilious attacks, the hepatic system is supposed to be congested, so as to perform its functions imperfectly; or, as may occur in certain cases, the mischief lies in one of the great nervous centres.

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* Philosophical Transactions, 1824, vol. cxiv. Part I. p. 45. Read 11th December 1823.

In the same class of subjects, gouty or inflammatory action of the kidney, uterus, or intestines is apt to be accompanied by predominance of muriatic acid.

On the other hand, the same derangements, when they take place in delicate, feeble, and nervous subjects, are often attended by the presence of an excess of lactic acid in the stomach. In all dyspeptic subjects, hard and crude indigestible matters taken into the stomach irritate the organ, and cause it to effuse a large quantity of the mixed acids, in which lactic acid almost always predominates; especially in the feeble and delicate. Excess of acid, and particularly lactic acid, in the stomach is usually accompanied with gastrodynia, that is, by rheumatic neuralgia, similar to that affecting other nerves of sensation. This is most frequent in gouty and rheumatic subjects, in whom the exciting cause of the acid effusion is some foreign indigestible substance.

The other acids formed in the stomach occur most generally in dyspeptic individuals, in whom the muriatic and lactic acids abound, and in whom the digestive processes are imperfectly performed. These acids appear to be derived chiefly from the food, and may therefore vary in nature. Carbonic acid is frequently developed, not only from the food, but from the stomach itself; and, in its gaseous form, proves a source of flatulent distension. Another, by far the most troublesome, source of flatulent distension is azote or nitrogen, which, in nervous subjects, is occasionally developed from the stomach in large quantities, in conjunction with lactic acid and with oxalic acid. At other times azote is developed from the food. But, whatever be the source of this gaseous principle, it usually causes much distress; for while carbonic acid gas, by reason of its stimulating qualities, generally escapes from the stomach, the passive character of azote, and the peculiar spasmodic constriction which attends its development, cause it to be retained, and by distension to produce great suffering.

Dr Prout thinks, in regard to muriatic acid, that, if the liver performs properly its duty, any free muriatic acid of the chyme, when it enters the duodenum, is neutralized by the soda of the bile. With lactic acid, especially in excess, it is different; for, from the circumstances under which the lactic acid is produced, there is in the duodenum no equivalent of alkali to neutralize it. The result is, that the free acid is either taken up with the chyle by the lacteals, or descends into the intestines; where, with other acids there formed and extricated, it produces various secondary symptoms yet to be considered.

Dr Prout is of opinion that the natural condition of the whole intestinal canal, excepting the cæcum, is either neutral, or verges to slight acidity on the one side, and slight alkalescence on the other. When the contents of the stomach, therefore, contain too much acid to be easily neutralized in the duodenum, they enter the inferior portions of the alimentary canal in a state more or less acid, and produce there various unnatural symptoms. These symptoms may be local or remote; and they differ in different individuals, and at different periods of life. In adults, while acid ingesta remain in the duodenum, great discomfort and uneasiness of various kinds are experienced. The transition of acid matters along the intestine causes a sense of heat and painful colic. If the acid matters, unneutralized, pass from the cæcum, they cause more or less pain in the colon, and in certain subjects produce flatulent distension and diarrhœa. In young children all these effects are still more strongly marked.

Excessive acidity in the *cæcum*, which produces remarkable effects, is generally accompanied by deficient secretion of bile; sometimes by temporary suppression of the bilious discharge, apparently from spasmodic constriction of the common gall duct, or of the biliary ducts. This condition gives rise to more or less uneasiness in all persons; and in some to what is called nervous headach. This species of headach, which is confined to the forehead, is often accompanied with nausea; and when severe, produces complete intolerance of light and sound, and a state of mind bordering on delirium. After a period, shorter or longer, the pain ceases, sometimes suddenly; while this sudden termination is preceded by a peculiar sensation in the region of the gall ducts, sometimes with an audible clicking sound. Immediately afterwards, a gurgling sensation is felt in the upper bowels, as if a fluid were passing through them; and in a few seconds, when this fluid, which is believed to be bile, has reached the cæcum, the headach at once vanishes like a dream. This has occurred in different individuals so regularly, that Dr Prout seems to entertain no doubt of the correctness of the statements and their explanation.

As to lactic acid, Dr Prout allows that it is impossible to distinguish between the primary effects in the *primæ viæ*, and the secondary effects which result when the acid is absorbed into the system. It is easy to see also, that, granting that absorption of this acid into the sanguiferous system does take place, the two conditions, that is, lactic acid in the alimentary canal, and lactic acid in the sanguiferous system, must in the majority of cases, co-exist.

It is important to observe, that of those who suffer in this manner, persons who suffer least from the primary derangements in assimilation, suffer in the greatest degree from those of the secondary class and their consequences. This Dr Prout ascribes in some degree to the fact, that such individuals pay less attention to diet and its regulation, than those whose primary disorders, taking place in the stomach, oblige to live with greater caution. In point of fact, those persons who make no complaint of stomach symptoms, and who eat freely of all articles, seem to go on pretty well for a long series of years. The time comes, however, when all this mismanagement begins to evince its natural effects. The urine becomes loaded; the liver and the whole duodeno-jejunal system are congested; and more or less fever, with derangement of stomach and bowels,—in short, a bilious attack, ensues. Means to remove this are employed, and the patient gets well; but in no long time resumes his old habits, and recals with them his former complaints.

The condition now mentioned which, in certain individuals, or in a certain class of the human race, proceeds for a long time without apparent hurtful effects, is, nevertheless, the initial or generating point—the common centre of multiplied serious disorders. In the class immediately adverted to who are of strumous habit, lax and flaccid in fibre, the food consumed is so great, that it bears no relation, scarcely, to the assimilating process and its effects. Large quantities of fæces are passed either spontaneously or by the aid of medicine; and the eating to the extent of gluttony is continued in the most persevering manner. If such individuals be well fed, they often attain old age; but they are liable to hypertrophies and morbid growths of various kinds, and usually die of dropsy connected with extensive organic disease. The children of such individuals, if offspring they have,—which, however, is often not the case,—are sickly, and often are cut off in infancy; and a third generation of such a race, unless counteracted by favourable marriages, rarely exists. Habits of this description, in various degrees, are often observed. When they take place in those disposed to gout and gravel, or rheumatism, they cause much torment, and usually abridge the duration of life. Persons of a different description, who get into the same habits, are the subjects of other disorders. Cutaneous eruptions, boils, carbuncles, attacks of erysipelas, rheumatic attacks, nephritic attacks, piles, blind and hemorrhagic, occasionally fits of irregular action of the heart, bronchitic attacks, and fits of asthma, are a few of the maladies to which persons thus designated are liable. All this class may be designated as bilious; that is, they are persons in whom the hepatic and the duodeno-jejunal vessels are in a state of constant over-distension, and therefore liable from slight causes either to have an attack of vomiting and purging, or to have some one of the secondary effects, as they may be termed, in the skin, the mucous membranes, or the aponeurotic membranes. With such persons, rose is a severe and formidable disease, in some instances terminating fatally. In some instances boils are so frequent, that they seem habitual, and act as a sort of safety-valve. But when these accidents fail to occur, exposure to cold or to malaria is not unfrequently followed by a bad attack of chronic or subacute rheumatism; and, in some instances, apparently without such exposure, rheumatism or gout is developed.

Dr Prout even alleges that the presence of lactic acid in the system may give rise, and does give rise, to fever and inflammation; and that the diseases thus designated cannot be distinguished from those which are the result of the presence and operation of this acid in the human body. In truth, it appears that lactic acid, when once formed, acts as a poison, and renders the persons in whom it is developed liable to attacks, acute or chronic, of various febrile and inflammatory maladies. These are, he maintains, either identical or nearly connected with those forms of fever and inflammation usually denominated *intermittent fever*, *rheumatism*, and *neuralgia*.

Though these diseases are usually produced by malaria, yet, while it is highly probable that the malarial poison does, in the first place, produce in the chylopoietic viscera a state of disorder similar to that already noticed, and, among other evils, causes an abnormal development of lactic acid in the system,—it must be allowed to be a correct inference that, wherever the same disorder of the assimilating functions, primary and secondary, is induced, the same or similar results may be anticipated to follow. Thus in ague and rheumatism, during the sweating stages of the paroxysms, immense quantities of acid, chiefly lactic, are thrown off by the skin, and sometimes by the kidneys. In these cases the saliva is acid; and, in the malignant fevers of tropical climates, not only the saliva but the whole assimilating organs, and even the blood itself circulating in these organs, have been observed to be in an acid condition. For the presence of so much lactic acid it is impossible to account, unless on the supposition that a certain portion of what ought to constitute, or has constituted, the albuminous or rather gelatinous parts of the system are decomposed or destroyed; and as gelatinous and albuminous textures cannot be converted into lactic acid alone, that consequently other unnatural and probably poisonous complementary principles are developed in conjunction with lactic acid, and which, along with that acid, may concur in producing many of the secondary consequences of mal-assimilation. In other words, the alimentary matters, which ought by the primary assimilating organs to be converted into albumen, and the albuminous matters of the blood, which ought to be converted, by the secondary assimilating processes into the living gelatinous and albuminous tissues, are, by the deficient and disordered operations of the vital processes, converted, in a degree greater or less, into lactic acid and other unnatural combinations.

The next question treated by Dr Prout is, what constitutes the difference between ague, rheumatism, and neuralgia, when the general conditions of the system are assumed to be similar? in other words, why does the presence of lactic and other acids in the system cause in one class of cases ague, in another rheumatism, and in a third neuralgia?

To elucidate this question, Dr Prout allows probable conjectures are all that can be adduced. It seems probable, in the first place, that, in intermittent fevers, the primary assimilating organs, namely, the stomach, the liver, and the spleen, are principally in fault; that the secondary assimilating processes, by which the structure of these organs is produced and maintained, are impaired; and that to the consequent imperfect development of these organs may be referred not only the formation of lactic acid and other pernicious matters generated during the digestive processes, but those organic lesions and morbid hypertrophies, which are apt to take place in the liver and spleen in severe and protracted fevers of this type. In rheumatism, the same derangement, to less extent, appears to exist in the primary assimilating organs. But, in this case, the secondary assimilating processes, by which the gelatinous portion of the muscular system and its appendages (aponeuroses, tendons, capsular ligaments) are produced and maintained, may be supposed to be especially implicated; while loss of power and the degree of pain usually present in rheumatism, may be referred to irritation of the numerous nerves of sense and motion, as well as to the affection of the *fasciæ* and other supports of the muscles. In these parts, also, imperfect assimilation and nutrition take place, and in this manner may be explained, Dr Prout thinks, the formation of the large proportion of lactic acid usually present in rheumatic affections, as well as the swelling and the effusions taking place within and around articulations. The same explanation, he thinks, may be given of the phenomena of neuralgic affections.

In conducting the treatment, remedial measures must be accommodated to the several modifications of the morbid conditions produced. The first object is to prevent mal-assimilation; the second, to counteract and rectify its effects. The prevention of the secondary effects is supposed in general to be most within the power of the physician; and, for this purpose, the usual practice is first to get rid of the unnatural material whose effects are to be obviated; and, secondly, to neutralize, by means of chemical reagents, its acid character, and thereby to render it, if possible, less hurtful. The chief rule which the author inculcates as most important as to the latter object is, to administer antacids, among which he prefers the carbonate of potass from about three to six hours after a meal has been taken, with the view of neutralizing the acid and ascescent *residua* of the meal. The alkalies, however, he reminds his readers, have no effect in preventing acidity. They only neutralize acids already formed. The prevention must be attempted by means of appropriate diet and medicines.

When acidity is seated in the cæcum, magnesia is the best remedy, because, being insoluble, it is not acted on till it advances far through the intestinal tube. The most speedy means, however, of removing this evil he represents to be the injecting one or two pints of warm water, or of soap and water, into the lower bowels. Drastic purgatives should be avoided. Laxatives should be given merely to empty the lower part of the colon.

In speaking of the treatment of ague, rheumatism, and neuralgia, the author adheres to general rules. The main point which he impresses, is the necessity of rectifying secondary derangements, and above all, of counteracting acidity. As the acid developed is the lactic, and as alkalies only neutralize this, and do not prevent its generation, while their effects are limited to the alimentary canal, he dissuades from their general employment. On the contrary, he recommends, as more beneficial in many of these cases, the use of the mineral acids, combined when the spleen is affected with quinine and iron.

The third chapter is devoted to the pathology of albuminous or nitrogenous assimilation and secretion; and in this the author treats of the excess and deficiency of urea, serous, albuminous, and chyloserous urine, and all the pathological states of the kidney with which these phenomena are associated. This subject is too extensive for us to enter on at present; and we have further often had occasion, in speaking of the works of Simon, Dr Golding Bird, Dr Bright, and the recent papers of Dr Johnson and Mr Toynbee, to enter more or less in detail into the subject. Here, therefore, for the present we pause. But we hope to resume, at no distant period, the examination of the treatise of Dr Prout.

Meanwhile, we have only to say, that to those who desire to obtain accurate and satisfactory information on the nature and causes of diseases of the assimilating functions, no book, either in the English or any other European language, can be recommended equal to the present. No other treatise contains so happy a combination of correct physiological and pathological knowledge, chemical science, ingenious reasoning, and sound judgment.

ART. II.—*Thoughts on the Nature and Treatment of several Severe Diseases of the Human Body.* By EDWARD J. SEYMOUR, M. D., F. R. S., late Physician to St George's Hospital, &c. &c. In two volumes. Vol. I. London, 1847. 8vo. pp. 260.

THE subjects discussed in the present volume are diseases of the stomach, gout, mental derangement, and sciatica. The mode in which these subjects are considered, is what is commonly called practical,—a term not always happily applied, especially when opposed to theoretical and pathological, which the author in some manner informs his reader he considers not eligible. To this we do not think proper to state any objection. The observations of the author may be received as those of a physician of experience, who is desirous to allow his brethren to have the benefit of those instructions, to which his pupils at St George's Hospital, we are informed, attached a considerable degree of importance.

I. Dr Seymour begins his view of stomach disorders by adverting to those in which more or less vomiting, with *cardialgia*, *gastrodynia*, and pain on pressing the epigastric region, followed by emaciation, are leading symptoms. These symptoms he ascribes to the presence of acid, and gives the usual reasons for the presence of lactic and muriatic acid being the causes of the evil. From the observations of Dr Prout, it can scarcely be doubted that both acids are present, and, occasionally, that others contribute to this form of gastric neuralgia. All these symptoms, he thinks, are to be combated by the regular administration of antacid medicines with sedatives, or alkalies with rhubarb, soda, and calumba root. (Is not soda an alkali ?) Pain being the most obvious symptom, without heartburn or vomiting, the author thinks depends on the stomach being thrown into irregular contraction, and then the remedy which he recommends as best is the trisnitrate of bismuth, combined with magnesia.

Water-brash, or the eructation of large quantities of watery fluid, tasteless, or slightly saline, the author regards as the indication of the presence either of very slight or very serious disease of the stomach. It occurs in persons who live much or exclusively on vegetable food, in females whose stomachs have been enfeebled by vomiting during pregnancy, in spirit-drinkers, and in persons labouring under organic disease of the organ. In the first and second orders of cases, it readily gives way to antacids and tonics, combined with more solid diet containing animal food, at least once in the day. The author speaks of curried food and weak brandy and water; but these, we can assert, are unnecessary, if the diet be properly regulated. A blister, which he also recommends, may be beneficial. Calomel and purgatives he most properly condemns, as their use is certain to aggravate the symptoms and protract the duration of the disease. In the third, the most necessary measure is the withdrawal of all spirituous drinks; on which the symptoms usually subside, and finally disappear under the treatment recommended above, so far as it can be carried into effect.

In the fourth case, when it attends the presence of malignant disease, it is easy to see that the treatment can be palliative only; and that, as it is a symptom and effect of great changes in the structure of the stomach, no effectual treatment can be adopted.

The organic disease which most commonly gives rise to this profuse secretion of fluid is *enkephaloma*, which Dr Seymour calls fungoid disease; and we have seen it also attend the areolar or kolloid karkinoma of the stomach. In the former case the disease may often be recognized by careful examination of the epigastric region, in which the skilful physician finds large irregularly round, firm masses. Even in the case of areolar or kolloid karkinoma, though the tumour occupies the greater part of the stomach, and does not appear in the form of lobulated rounded masses, but one uniform occupation of the tissues of the stomach, yet, from its firmness, the tumour may often be recognized during life.

Pain referred to the stomach, the author observes, may arise also from gall-stone either in the ducts or in the gall-bladder, and from a disease of a very formidable character, the chronic ulcer of the mucous membrane of the stomach.

The following short sketch gives a correct view of many of the peculiarities of this disease, and makes it be regretted that the author has not given a more full and systematic view of this affection.

"The pain generally continues, at times, from year to year, and occasionally receives little sympathy from surrounding friends. It is, however, not frequent in the class of life where good food, rest, and the luxuries of life, are attainable; but oftener in persons, especially women, broken by servitude, or distressed by wayward affections. The end is generally sudden. This is simple ulceration of the stomach going on to perforation.

"Even in this last case, the liver or the pancreas applied over the aperture become glued to the orifice by adhesive inflammation, and danger, for the moment, is averted; or another morbid condition arises, which I shall explain hereafter, which delays, in a remarkable manner, the fatal event. Sometimes the ulceration, before arriving at the perforating state, erodes the branch of an artery; then comes vomiting of blood, occasionally to a very great extent. Still, such cases are rarely mortal in this stage of the disease.

"I have seen many pints of blood vomited under such circumstances without any real danger, as it appeared; but, after death, a healed ulcer in the stomach, which, in its ordinary state, had involved a small branch of the superior coronary artery, was discovered.

"The ulceration in question occurs principally in the smaller curvature of the stomach, and most frequently on its posterior surface: hence the pancreas has been most frequently found, from its position, assisted by adhesive inflammation, to have arrested immediate danger.

"The chronic ulcer of the stomach is not to be distinguished by any known signs, unless vomiting of blood, which has followed long-continued symptoms of pain and distress in the stomach, has taken place. Up to this time it is easier to say what the disease of the stomach is not, than what it is.

"The patient has long felt pain after eating, without the symptoms of the presence of acid which I have before described. At one time one species of aliment, at other times another, seems to aggravate the symptoms. Solid meat is generally felt to be most distressing; and the state of emptiness is the state accompanied with the least pain, as in a case related by Mr Travers in the Transactions of the Medical and Chirurgical Society. Suddenly the symptom of pain becomes accompanied by constant vomiting and a painful burning of the epigastrium, with extreme pain in the opposite vertebræ; the pulse becomes very small and weak; and cold extremities and shrinking features denote the approach of death, which occurs in a few hours after the aggravation of the symptoms: and on examining the body, perforation of the stomach,—simple nearly circular ulceration, without any thickening of the edges, without any inflammation of the surrounding mucous membrane,—is seen. In such cases the patient has not lost flesh, as in the case of cancerous or fungoid disease. No examination, however careful, can distinguish before death either hardness or fulness; nor has the appearance of the tongue shown by its bright redness that serious irritation is established in the stomach; neither does the external surface of the body present the straw-coloured appearance, arising not only from the absence of red blood, but as if the vessels were filled with size.

"None of those symptoms appear to be present which are so characteristic of malignant disease; probably because the ulceration occupies a small portion of the stomach: the surrounding mucous membrane has all the appearance of being in a healthy condition.

"I was called two years ago to see a servant of all work, about 20 years of age, who was dying with all the symptoms of perforation. She had long complained of pain in the stomach; but went about her usual laborious occupations. Suddenly, after eating *a very large meal* of salted beef, she exclaimed, placing her hand on the region of the stomach, that she was shot! Violent vomiting ensued without much of the contents of the stomach being brought up. She became insensible, though still giving signs of pain when pressed with the hand on the epigastrium. She died in about five hours after the attack. In the morning of that day she had appeared to be perfectly well.

"But it has been said that, even after perforation of the stomach, it by no means necessarily happens that the patient immediately dies. In two cases which occurred to me in St George's Hospital, one survived the perforation five months, and another twelve days, after the most violent symptoms of peritoneal inflammation. As such cases are undoubtedly rare, *i. e.* cases in which persons have lived after perforation of the stomach, the secondary process which prevented immediate death has never been described."—Pp. 16–19.

Two cases are subjoined. But for these we refer to the work itself.

The treatment of cases of this nature, when the fact of their existence is established, is, so far as may be practicable, simple enough; but no treatment is always effectual. The most soothing remedies and the total withdrawal of all medicine by the mouth, excepting opiates, are known to be indispensable. Blisters applied to the epigastric region are useful by the counter-irritation which they cause, and by the derivation which the superficial inflammation thus induced, establishes. Indeed, in one of the best authenticated cases of recovery, that of Beclard, the professor of anatomy in Paris, recovery was effected under the use of very low diet, and the counter-irritation, produced by friction, with the tartar-emetic ointment. The bowels he recommends to be kept open by means of enemata. Absolute rest, in the supine position chiefly, is of great moment.

The author reposes much confidence in the oil of turpentine taken internally, as the means of healing and effecting cicatrization of these ulcers. His language on this head will to many appear strong; but the remedy has certainly just claims to be tried. He states, that both in the Seaman's Hospital and in St George's Hospital, during eighteen years of assiduous duty and in private practice, he never saw a case which did not for the time being recover under the use of this remedy. In three cases, in which the patient had suffered from this disease, and the hemorrhage attendant on it had entirely ceased, under the use of oil of turpentine, healed ulcers, into which small branches of arteries could be traced, were observed in the surface in all, on the posterior surface (region) of the stomach. But in a great many more cases, in which the patients are still living, after a lapse of several years, and where, of course, the accuracy of the diagnosis cannot be proved, the disease gave way to the use of the oil of turpentine. Not only, adds the author, were large quantities of blood vomited in such cases, but large quantities passed half digested from the bowels, under the form of thick matter, resembling soot in appearance. "I do not remember," he adds, "to have witnessed a single case in which this treatment failed; and, notwithstanding that the medicine is very nauseous, it rarely happens that it is rejected by vomiting."

The dose and form in which he gives the remedy is two drachms oil of turpentine and two drachms castor oil, with yolk of egg in cinnamon water, syrup, and tincture of ginger, so as to form a draught to be taken every morning or every second morning.

It is well known that this disorder has been most frequently observed in females, and especially in young females. Domestic servants are those in whom it has been most usually seen; and Mr Taylor, in a paper on the subject in Guy's Hospital Reports, records nine cases which occurred exclusively in young females. We have seen the disease in males; but we acknowledge that most of the cases which have occurred, either to the author of this notice or to his friends, have been in females. Rokitanski gives, on the statistics of the disorder, some useful information, which we may take an early opportunity of placing before our readers. From a comparative view of cases from different sources, Dr Seymour is disposed to conclude, that the proportion of males is rather greater than that of females affected by the disorder. To the cases given by Cruveilhier, as belonging all to this form of disease, we are doubtful whether perfect confidence can be attached. But it appears, from the account of Dr Seymour, that Mr Prescott Hewitt found among twelve cases of the disease, eight among males and four among females; and Dr Seymour himself states, that among eight cases, five took place among males and three among females. The author himself expresses his belief, that there is no preponderating influence in either sex as to predisposition to the chronic ulcer of the stomach.

In speaking of the regulation of diet, and the selection of dietetic articles in treating diseases of the stomach, Dr Seymour is disposed to estimate very lightly indeed all the strict and positive rules on this subject laid down by physicians; and concludes that the whole question resolves itself into the observance of moderation. He thinks that persons may take what their inclination and taste lead them to take, providing they do not exceed in quantity. All this is very well. But it is a known fact that the very articles in which persons are likely to exceed, are those which taste and inclination lead them to select. It appears to be necessary, in the treatment of many stomach disorders to permit food not always very palatable, because, when it is palatable, the patients are liable to take more than is proper for them in the actual state of the stomach and digestive organs.

Vomiting is considered as a symptom of indigestion; of the presence of gall-stones; of simple irritability of the stomach; of pregnancy, of hysteria; as symptomatic of disease of the brain, of pulmonary consumption, and of tubercular *peritonitis* and accretion of the *peritonæum.* On the latter disorder, namely tubercular *peritonitis*, Dr Seymour communicates various useful observations. He very properly condemns as hurtful the use of mercury in the treatment of this disease; yet he adduces one instance of the chronic form of the disease, probably simple chronic inflammation without the formation of tubercles, in which, after iodine in all its forms had failed, recovery was effected apparently in consequence of the use of mercury.

The truth is, we believe, that neither mercury nor iodine are the true remedies of this disorder. We have seen it disappear without the use of either of these agents. The great object appears to be to moderate inflammatory action by measures which do not impair the strength. Local bleeding by means of leeches; counter-irritation by means of blisters, or croton oil liniment, repeated according to circumstances and effects; due regulation of the bowels; the warm bath twice in the week; and great care as to diet,—comprise the means which are most likely to prove curative. When iodine is given, it ought to be after the degree of inflammation has been considerably abated; and then it is best given in the form of hydriodate of potass. Yet we have seen nitrate of potass accomplish as much good apparently as the hydriodate. The disease is nevertheless formidable, and in certain circumstances proves unmanageable under all remedies and every sort of treatment. The tubercular form, we believe, when established, to be very rarely cured indeed.

The subject of chronic inflammation of the mucous membrane of the stomach and intestinal tube suggests various judicious observations. He states, that in his observations, the chronic *gastritis* of the French school has been always cured by mercurial alteratives and saline purgatives. Were this the case, it might reasonably be questioned whether the diagnosis were perfectly correct; for we believe all experience goes to show that such remedies are hurtful; and though cases may, under or after their use, seem to recover, yet either the amelioration is temporary, or the complaint proved to be not genuine *gastritis.* On the other hand, Dr Seymour admits the bad effects of the over-feeding on which this disorder so often depends, and allows the benefit resulting from abstinence and gruel-diet.

The last subject noticed is the gelatiniform softening of the stomach, so common in infants, and sometimes seen in adults. But as the author appears not himself to have witnessed the disease, we shall pass to the ensuing chapter.

II. The subject of this is gout. The information, though communicated in a manner rather desultory, is interesting. But this, probably, is one reason why it is read with some degree of interest.

As it is chiefly the therapeutic part of the essay that claims attention, to that our remarks principally apply. The remedy which Dr Seymour mostly recommends is the use of meadow-saffron, and he is anxious particularly to demolish all those objections deduced from the supposed injurious effects of this energetic drug. He properly observes, that persons labouring under gout are liable to be destroyed by various internal affections, sometimes rather suddenly, — for instance, by affections of the heart, of the arteries, of the brain, of the stomach, and of the lungs,—and that it is neither just nor rational to ascribe to the influence of any remedy, and especially of meadow-saffron, results which, there is quite as much reason to suppose, proceed from the disease. Dr Seymour is also desirous to caution practitioners against giving large doses of this active substance, however much they may be solicited by patients to do so, in the extreme anxiety to get rapidly rid of a painful and debilitating disease.

The great difficulty is to select the proper form of preparation. One person prefers the wine of the seeds as the most uniform and effectual; another gives the preference to the wine of the root; a third person recommends the acetous extract; and a fourth may prefer giving the acetous solution. In severe attacks of gout, Dr Seymour begins by giving one scruple of the wine of the root twice daily, and in the evening, supposing the bowels are open, three grains of the acetous extract with five grains of Dover's Powder. If the bowels be confined, he gives, with three grains of the acetous extract, six grains of extract of colocynth with one or two grains of calomel, in the form of two pills, to be taken at the hour of rest. The medicine may be given in this manner for days or weeks, so long as it produces neither vomiting nor smart purging, when it should be left off. But in either case considerable relief will follow, and in some cases the disease entirely disappears.

This is the general principle of procedure. In some instances, it is necessary to continue the use of purgative medicines a little longer, and to give them more freely, yet chiefly to obviate constipation. In those instances in which febrile symptoms are prominent and considerable, it may be requisite to give tartarized antimony.

A domestic remedy, which the author eulogises, is the decoction of burdock root (*Arctium Lappa*). Two ounces of the sliced root of burdock, well washed, he desires to be boiled slowly in a pint and a-half of water down to one pint, and then strained. This pint is to be drunk in the course of the day and night with an equal quantity of milk. The same remedy has been long used by the common people for the removal of rheumatic pains, especially lumbago and sciatica.

Repeated attacks of gout, however, produce an impaired state of the health and strength, which demand considerable modification in the use of remedies. In such cases, in which meadow-saffron and similar active remedies cannot be administered with great freedom, and without incurring some risk, Dr Seymour recommends the employment of warm-bathing, and, for this purpose, he expresses the opinion, that the waters of Bath are, for the restoration of patients, the best in Europe. Warm or hot-baths in general are most suited, he thinks, to the removal of the gouty diathesis or the alleviation of its effects, and therefore better suited to the treatment of patients after repeated attacks of gout than at the commencement and the first approaches of that malady. When the attacks have left, therefore, swelling and stiffness of the joints, and have either rendered the patient lame or threaten so to do, he thinks that the proper remedy is either the use of the Bath waters in this country, or the hot waters of Wiesbaden in the modified form, and those of Karlsbad in the aggravated forms of the disease, where lithic acid or lithate of ammonia is discharged or secreted in considerable quantity.

"In persons predisposed to gout from hereditary causes, but who, by careful habits, have added nothing to this predisposition, especially in females, the following is a frequent form of indistinct gout. The joints of the fingers and toes are swollen, thickened, and painful—not acutely painful, but painful; and this is especially the case on rising in the morning, or going to rest in the evening, when the ligaments and tendons of the ankles and heels especially participate in the pain and stiffness. In such cases, the physician will find the patient with little appetite, the mind brooding over trifling miseries, and much pain in the smaller joints; there will be a sallow, not yellow, appearance of the countenance, and a discontented feeling, even though prosperity surrounds the patient: these complaints are often attributed to cold, and go under the vague name of rheumatism."—P. 114.

In such cases, Dr Seymour recommends, after the use of meadow-saffron and such remedies as decoction of mezereon, the employment of the Karlsbad waters externally and internally. The

Buxton waters, he thinks, are more beneficial to cases of rheumatism than to those of gout.

In speaking of this application of hot mineral-waters, Dr Seymour thinks that the high temperature of the Karlsbad waters, with the large proportion of alkali which they contain, must well adapt them to gouty cases of the description specified. Their use is said to cause the discharge of lithic acid concretions.

The temperature of the Karlsbad waters, however, cannot certainly be the important curative element. Neither these nor any other hot waters can be used at a temperature above 98° or 100°; and it is very generally inculcated by all who pretend to experience in the use of hot-baths, that they are more useful when used below 96° and near 90° than at more elevated temperatures. Their alkaline impregnation is probably the means of alleviating the effects of lithic acid. If this be the fact, it is certainly a much easier and more pleasant and safe method of getting lithic acid expelled from the system than by means of meadow-saffron, which is often not unjustly blamed for doing injury to the stomach and alimentary canal.

It is to be borne in mind that not only the high temperature of the Wiesbaden springs, but their arsenical impregnation, may render them more advantageous for those forms of rheumatic gout, in which the different articulations become nodose and covered with porcelain deposit, and are otherwise rigid and imperfectly moveable.

It seems, nevertheless, singular that the hot salt water, that is, the sea-water bath, seems to find little favour with gouty physicians and gouty patients. Yet few remedies are more efficacious in restoring the tone of podagric joints, and none more safe and efficacious as a general remedy against the gouty diathesis.

Dr Seymour is next led to speak of gouty concretions, or those bodies called chalk-stones, occurring in the joints of the gouty; and here he manifestly conjoins those instances of incrustation of the articulations, which take place as the effect of synovial rheumatism. This union of two things, which are not positively proved and agreed to be the same, is, it appears to us, unfortunate. That they are decidedly different we do not mean to assert; nor do we think that there is as yet sufficient evidence to show that they are different. But we are not less certain, that there is very little evidence to prove that they are the same. We only wish, that a physician whose experience has been so extensive, could have informed us what results that experience furnished to elucidate this question.

According to the recent analyses of gout chalk-stones by Laugier and by Wurzer, it appears that these bodies consist chiefly of urate of soda, as was ascertained by Wollaston, and contain besides some muriate of soda and some lime.

Dr Seymour has not been more successful than his predecessors in applying remedies for the solution or the removal of these concretions. He informs his readers that he employed nitro-muriatic acid without success, and that he has seen *liquor potassæ* in full doses given and continued long, both in the diathesis which causes the deposition, and in cases in which depositions have been long formed; but in no case could he satisfy himself that any real advantage was gained.

Of benzoate of potass and benzoate of ammonia he speaks in the following terms:—

> "I have used this medicine repeatedly in practice, in cases in which the small joints were red, swelled, and painful; or where fluid matter was deposited in the joint of the great toe soon after the paroxysm commenced; and also in cases where the lithate of soda existed in the joints of the fingers, and superficially immediately under the cuticle on the surface of the lower extremities; and my impression certainly is, that it is decidedly useful. It is my impression that the early depositions have been arrested in their progress, and large depositions diminished, by the continued use of this medicine. It is a decided diuretic, acting in some cases of dropsy fully and freely, and is especially adapted to those cases where constant nausea, and occasionally vomiting, render the use of many medicines in the class of diuretics impracticable, and also, where diarrhœa exists, forbid the employment of saline diuretics."—P. 123.

The formula in which the remedy is used is from ten to fifteen grains of benzoate of ammonia in a little distilled water, sweetened with syrup, forming a draught to be taken two or three times daily. In cases in which diuretic effects are desired, five grains of borate of soda are added to each.

The rest of the chapter is occupied in discussing the merits of bitters, especially the Portland powder, the Chelsea Pensioner, flowers of sulphur, cold applications and cold bathing, the cold water treatment, and psoriasis and pompholyx, as eruptions which sometimes take place in the gouty in the intervals between the fits.

We cannot help being of opinion, that Dr Seymour is improperly severe against Dr Cadogan, in relation to the essay of that physician, in which he discusses the merits and demerits of the Portland powder. We allow that the learned doctor did attack that celebrated nostrum with great keenness and severity; and it is very probable that several of the cases which he specified as examples of the hurtful effects of the powder, were instances of the natural termination of life in gouty persons. No doubt, however, was then entertained, that in several instances of persons who had taken the Portland powder, the advent of the fatal termination was accelerated, certainly by many months, probably by several years. The great service, however, which Dr Cadogan rendered was this. He showed that of persons who trusted for a cure to the use of the Portland powder, the attention was withdrawn from the proper method of treatment, and directed to one which, instead of being good, was essentially bad; and that it was absurd to propose, as this method implied, that all cases of gout, however different, were to be treated indiscriminately by the same remedy. One of the great evils of the employment of the Portland powder was, that it increased the appetite in an unnatural and morbid manner, in persons in whom it was actually a real injury to do so. In the majority of gouty persons, the appetite is in general inordinately keen; and whether it be so or not, they never require any assistance to increase its activity. On the contrary, one of the most useful services than can be rendered to gouty patients, is to diminish the preternatural activity of the appetite; and hence the beneficial effects which have at all times resulted from the use of tartrate of antimony and meadow-saffron; and hence ipecacuan in minute doses was proposed about forty years ago by Daubenton. The effect of the Portland powder was entirely the reverse, for it gave an unnatural stimulus to the stomach, and made the patients believe, that they were actually digesting better. They accordingly continued to eat, drink, and be merry, convinced that their sheet anchor was the Portland powder, and that so long as they took their doses, restraint in diet was altogether unnecessary. Death, in consequence, came upon these persons like a thief in the night. Thus one man with hypertrophy of the heart, another with ossified arteries, and a third with enlarged liver, all continued their habits, till their vascular system was as completely distended with blood as it could possibly be. The result was, that the first was suddenly destroyed; the second died apoplectic; and the third died of dropsy of the abdomen in a very short period.

The Dissertation of Dr Cadogan was not only urgently required at the time, but it did great service; and nowhere do we find so rational, so eloquent, and so forcible an exposition of the evils attending the empirical treatment of a disease, which, more than any other, requires the management of a judicious and watchful physician. It is to us matter of wonder that Dr Seymour does not espouse the cause of Dr Cadogan, who only inculcated the indispensable necessity of temperance in diet, and proper exercise; and whose endeavours, if they did not prove the wickedness and the folly of attempting to treat all cases of gout indiscriminately in the same manner, certainly showed that, by treating all indiscriminately with Portland powder, great and irreparable mischief was done. In truth, Dr Cadogan merely recommended in 1771 that moderation in diet which Dr Seymour advises in 1847.

Dr Seymour will, we trust, not be offended with us for reminding him, that the essay or dissertation of Dr Cadogan was published before the Commentaries of Dr Heberden; and we are inclined to think that the observations by Dr Cadogan were also made at a period considerably anterior to that at which Dr Heberden made his observations. The Dissertation of Dr Cadogan was published in 1771.* The Commentaries of Heberden did not appear till 1802. The Dissertation evoked several answers. But none made any approach to the vigour and talent displayed in the essay assailed. The truth was, that Dr Cadogan had common sense and science both on his side; and, when these are supported by talent, clamour and opposition have small influence. The best of the performances of the opponents was that by Dr Falconer of Bath; and he substantially admitted the force and justice of the arguments employed by Dr Cadogan.†

All this is so much more extraordinary, that Dr Seymour recognizes at once the folly of applying the cold water treatment indiscriminately to all cases even of bad health; and so much more to all cases, we infer, of gout. His observations on this subject are sensible and interesting. We always said, and said so several years ago, when we gave an account of the method of the Silesian water-doctor,‡ that the drinking cold water was truly the best and most useful part of his system. The same we say at present; and we recommend strongly the adoption of this part of the treatment without reserve or equivocation. Beyond this, however, we do not advance; as we see nothing but quackery, reckless and shameless, in all the rest of the treatment. The observations of Dr Seymour may be recommended as deserving attentive perusal.

III. Chapter third is devoted to the consideration of that form of mental derangement termed melancholy, or the alternation of melancholy with violence called *lypomania*, or suicidal madness, especially in reference to the treatment of this form of disease by the employment of opiates, or of that class of medicines called sedatives.

Dr Seymour observes that the brain, its membranous coverings, and its vessels, are liable to diseases of two sorts, in which its functions are more or less disturbed, and, in common language, deranged. These are certain organic changes taking place either in the brain, or in its vessels, or in its investing membranes, and certain disorders taking place in the functions of the organs, without serious change in the structure. In the former case, in which the mental faculties may be more or less disordered, sometimes quite, or nearly quite, extinguished, little or almost nothing can be done to restore them to the state of health. In the latter case, a great deal may be done; and with proper attention, and due selection of remedies, the patient may be restored to such a degree of health, both of body and mind, that no trace of the previous disorder is left.

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* A Dissertation on the Gout, and all Chronic Diseases, jointly considered, as proceeding from the same causes; what these causes are; and a Rational and Natural Method of Cure proposed; addressed to all Invalids. By William Cadogan, Fellow of the College of Physicians. Ninth Edition. London, 1771. 8vo.

† Observations on Dr Cadogan's Dissertation on the Gout, and all Chronic Diseases. By William Falconer, of Bath, M. D. Edition the Third. Bath, 1772. 8vo.

‡ Edinburgh Medical and Surgical Journal, vol. lviii. p. 181. 1842.

Dr Seymour, while holding the office of one of the metropolitan commissioners of lunacy, and having occasion to visit various establishments for the management of the insane, was led to inquire into the question, whether any medical means were used, with the view of restoring to their healthy exercise the mental faculties of the occupants of these mansions. It appears that the result of this inquiry was, that nearly the whole treatment resolved itself into what is called moral management, and the regulation of the bowels by purgatives, except in the case of intercurrent diseases.

One of the few exceptions to this system was in the large lunatic establishment in Bethnal Green belonging to Dr Warburton, called Red and White Houses, and at that time under the medical management of Messrs Beverley and Phillips. It appears that these gentlemen found great benefit to result, from the use of acetate of morphia in the treatment of bad, and especially suicidal cases of mania. The results of this practice were given by Dr Seymour in the Croonian Lectures of 1831.

The author had occasion subsequently to employ the same mode of treatment in private; and from what he has himself witnessed of the effects of the remedy, he thinks he can speak with some confidence of its merits.

The following statement may be given as containing a short summary of the mode of exhibition and the results of treatment:—

" The preparation which I have preferred, and, with two or three exceptions, I have always used, is the acetate of morphia; the mode of preparation the solution: forty drops of the solution which I have generally employed contain one grain of the alkaloid salt.

" It has generally been, in mild cases, my practice to begin by a quarter of a grain every night in solution;* then, after a week, to increase this to half a grain: it has rarely in such cases been necessary to increase the dose beyond half a grain. In severe cases, I begin with half a grain (twenty drops), and increase it speedily to a grain (forty drops); rarely, most rarely, beyond this dose. The medicine is given at bed-time, and only at bed-time, the period which is intended for sleep; but it must be repeated, without the *intermission* of a single night, for several weeks in mild cases, for at the least three months in the most severe ones.

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* In substance the effect is far less well marked. In some stomachs, pills are scarcely dissolved at all. In all, except as regards purgative medicine, pills often pass unchanged.

This remark is especially referable to calomel pills, " made for the winter," or made with gum, which after keeping harden.

"In some of these cases at first sleep is not produced; in very few *rest* is not produced. Slight nausea, and disturbance of the head, are felt the first few mornings, but in these cases almost always at first, and *always after* a short time, both sleep is procured and the waking hours are free from pain."—Pp. 159, 160.

The author is anxious to answer objections against the practice, and, above all, that of persons so treated requiring the constant and habitual use of opium, and accordingly the risk of their becoming opium-eaters. He properly observes that this is the abuse, not the use, of a valuable drug; and that no objection can or ought to be taken against the moderate and regulated employment of the agent in those circumstances, in which it is indispensably required.

"In the cases hitherto related, no remedy was in the great majority employed except the morphia, and taking the precaution of keeping the bowels open every alternate day. This is necessary, as on the first administration the morphia constipates, but after some few days this disagreeable consequence disappears, and there are no longer white evacuations or difficulty in the functions of the bowels. In two or three of these cases, in the first place ice was applied to the head; but this remedy is better adapted to the determination of blood to the organ of the brain in mania, where blood-letting cannot without danger be had recourse to. It undoubtedly assists where melancholy intermits with paroxysms of violence."—P. 172.

The remedy is by no means new. It was recommended in the treatment of cases of mania with sleeplessness by Bernard Heute; and was afterwards extensively used by Esquirol. Dr Seymour has nevertheless the merit of directing the attention of the profession to the benefits of the practice, conducted on a regular and methodical plan.

The residue of the chapter is occupied with observations on the use of other remedies, and various illustrative cases.

IV. In the fourth chapter the author treats of Sciatica and the treatment which it requires.

He properly observes that this disorder is very variable in its nature, according to the difference of the subjects in whom it takes place; and that it consequently requires different modes of treatment. He recommends particular attention to the general health; the observance of rest; the employment of laxatives to keep the bowels regular; nutritious food, though with regulated diet; hydriodate of potass; the external use of oil of turpentine; acupuncture, counter-irritation, and the judicious employment of such sedatives as acetate of morphia, extract of belladonna, extract of hyoscyamus, and aconite.

Our limits permit us not to enter into details, for which we refer the reader to the work itself.

In conclusion, this volume contains much valuable and interesting practical information; and it promises to be useful not only in that which it communicates, but in suggesting to readers subjects for profitable reflection.

ART. III.—*Observations on Hospital Gangrene; with reference chiefly to the Disease as it appeared in the British Army during the late War in the Peninsula; with Prefatory Remarks. To which are appended, Cases showing how extensively applicable the Antiphlogistic Treatment is to other Diseases of the Army.* By JOHN BOGGIE, M. D., Surgeon to Her Majesty's Forces. Edinburgh and London, 1848. 8vo. Pp. 151.

MORE than one-third of a century has now elapsed since the termination of that great and protracted but decisive struggle, which was carried on in the Peninsula and concluded in France; and of the surviving actors on that great theatre, many have wholly retired from the scene, and others have become so aged, that they are contemplated by the present race as men of a former generation. The result is, that the transactions carried on in the Peninsula, and the experience thence derived, have been, if not forgotten, at least very much overlooked; and the tendency of the present generation is rather to look to itself, little heeding those lessons which were first learned, and afterwards taught, by the hard-working surgeons of the army. Yet the knowledge and experience of these gentlemen contributed in no ordinary degree to improve the practice of medicine and surgery; and the difficult positions, in which they were occasionally, by the casualties of warfare, placed, tended to make them think with that originality, and act with that boldness, which was safety to themselves, and advantageous to their successors. One eminent military surgeon, who distinguished himself much in service, has been for several years past collecting anew the experience of his military life, and comparing it with that subsequently acquired in civil practice. To one portion of his labours attention was directed in this Journal; and the other we may yet take an opportunity of considering.

Before us is the production of another army surgeon, who, in circumstances of no ordinary difficulty, devised a successful method of treating a disease which was little less fatal perhaps than the shot of the enemy.

Soldiers, and it may be added, seamen, are subject during active service to two different orders of diseases, exclusive of the wounds and injuries which follow an engagement. They are liable to various diseases which attend hard duty, exposure to vicissitudes of atmospheric temperature, to atmospherical agencies, as malaria, and to the effects of climate. But besides these, the wounded are liable, after an engagement, to be attacked with various disorders, which always complicate much the treatment, and sometimes render all treatment of little avail, and increase greatly the mortality necessarily attendant on a contest sufficiently sanguinary in itself. Thus, after a battle, whether by sea or by land, the wounded, even, who have escaped wounds and injuries affecting the head, the spine, the thoracic, or the abdominal viscera, which are usually immediately or in no long time fatal, are liable to be destroyed by fever, by inflammation, by inflammation of veins, by purulent absorption into the vital organs, by locked jaw, by acute or traumatic gangrene, and by gangrene or mortification attacking the wounds. It hence results that the fatality of a wound does not, in all cases, depend on the parts injured. A wound of the extremities, in which all the vital organs of the viscera are entire, may nevertheless prove fatal, though at first sight not severe, by giving rise to inflammation of veins, by causing the absorption of purulent matter into the venous system, by giving rise to locked jaw or acute gangrene, or by the wound being attacked by a species of inflammatory sloughing. It is not easy to say which of all these complications is the most dangerous. All are liable, in different circumstances, to prevail. Tetanus, traumatic gangrene, and hospital gangrene, are the most obvious, and therefore they have attracted most attention.

It is well known that hospital gangrene prevailed very frequently after actions in the Peninsula, and that many wounded men were destroyed by this disorder appearing in the hospitals after almost every action. The disease consists in a species of rose, or gangrenous erysipelas, attacking the surface and edges of wounds; and so suddenly does it appear under certain circumstances, and so speedily does it prove fatal, that the slightest wounds become a subject of the greatest anxiety to the military surgeon. Its appearance, also, in one case in a military hospital, is invariably followed by its affecting others of the wounded; while the violence of the constitutional symptoms by which it is attended, and the difficulty and uncertainty of controlling either the local affection or the general disorder, justly make surgeons look on this disease with great horror. Few objects, in short, show in a light more distinct and impressive the evils of war, than the wards of a military hospital soon after a great battle has been fought. Exclusive of those dying of wounds and bayonet thrusts in the head, chest, and abdomen, may be seen not a few young robust soldiers wounded in the extremities, yet with the burning fever, the ghastly countenance, and glazing eye of hospital gangrene, all betokening, with rapidly-advancing step, the approach of death.

It was the fortune of Dr Boggie, the author of the present short essay, to witness much of this dreadful scourge in the Cordileria Hospital of Bilboa in 1813. The battle of Vittoria was fought on June 21, 1813, and the wounded were brought to Bilboa, where were large religious houses used as hospitals, in order to be treated properly. In the Cordileria Hospital alone were received more than 800 men. Hospital gangrene appeared very quickly the same month. All the usual approved measures, but especially nutritious food, with stimulants and bark, were liberally administered; and when these means were found unavailing, the usual resource was amputation, in order to save the life of the patient. Yet all these measures were inadequate to eradicate this formidable malady, which speedily over-run the whole hospital. Between the 31st of July 1813 and the 20th of October, a period embracing not more than eighty-one days, 250 men had died in that hospital, and more than 150 amputations had been performed. The mortality from this cause alone was about 80 per month. In one month, 150 men had each one limb amputated. This was at the rate of five amputations daily.

Yet was all this energetic practice quite unavailing. After the operation, the disease in most cases attacked the stump, and no other expedient appears to have been thought of except the actual cautery in a few instances, and, in the majority, another amputation. In several instances, amputation was performed three times in the same individual.

At this crisis, Dr Boggie, who had been in England on account of his health, arrived at Bilboa in the month of August 1813, and was directed to enter on duty at the Cordileria Hospital. After beholding for some weeks, with no very gratifying feelings, the ravages of this disease under the usual established methods, it occurred to him, that, as the disease was manifestly attended with inflammatory symptoms, and as all the stimulating treatment had been worse than unavailing, and seemed directly injurious, it was certainly worth while to try the effects of an opposite method. He accordingly adopted antiphlogistic measures, reduced or with-drew the allowance of animal food and wine, and employed purgatives and laxatives, and blood-letting at first cautiously, and subsequently with greater confidence. The effects of this change were strikingly beneficial. The disease became more manageable; the wounds got rid of their unfavourable appearances and were more easily healed, and the mortality was very much reduced.

It is proper, however, that Dr Boggie speak in his own person. The following is the description which he gives of this disease:—

"There are two forms under which Hospital Gangrene usually appears, viz. the Sloughing and the Phagedenic; they, for the most part, exist separately, but they are not unfrequently combined in the same sore. The first I would name Contagious Gangrene; the second Gangrenous Phagedæna. Professor Delpech of Montpelier, who has given a very excellent account of this disease, mentions four different forms. The first he denominates the Ulcerous (Ulcereuse); the second the Pulpous (Pulpeuse); the third and fourth seem to be varieties of these two.*

"When a wound or ulcer is affected with contagious gangrene, it becomes painful and swollen, loses its healthy florid appearance, and the granulations, which were small and distinct, become flabby, and appear sometimes as if they were distended with air; at other times, vesicles containing a watery-coloured fluid, or bloody serum, have been observed, and the sensation in the sore has been described as resembling the stinging of a gnat. The secretion of pus is suspended; the wound is dry, and covered with a tenacious viscid ash-coloured matter, which adheres firmly to the surface. When this morbid state has existed for some time, a discharge takes place of a thin ichorous matter, of a very peculiar smell, the pain increases, the edges of the wound are reverted, and in general assume a circular form; an erysipelatous redness surrounds the wound, and sometimes extends to a great distance, even over a whole limb; the neighbouring glands, as those of the axilla or groin, swell, inflame, and sometimes suppurate; febrile symptoms become apparent; the pulse is accelerated, full, and strong; the heat of the surface is much increased; the patient complains of nausea and thirst; the tongue is covered with a whitish or brown crust; and the bowels are in general constipated. The inflammation goes on increasing, the thin ichor continues to be discharged in great quantity, and a thick slough, apparently of coagulable lymph or fibrine, like melted tallow, covers the whole surface of the wound; the fetor becomes intolerable, and the pain quite insupportable. In the last stage, there is, in general, an oozing of blood from the surface of the wound, and not unfrequently distinct hemorrhage, from the corrosion or destruction of the larger blood-vessels. Sphacelus takes place to a greater or less extent; the strength of the patient fails; the pulse sinks; his countenance becomes collapsed and altered; the skin is bedewed with a clammy sweat; and a diarrhœa with hiccup coming on, the scene very soon terminates.

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* Vide Memoire sur la Pourriture d'Höpital, p. 4, *et seq.*

"Though this is the most common form of the disease which I have seen, as it occurs in a recent wound, and in strong healthy men, who are the ordinary subjects of it, yet I am well persuaded that the fever which accompanies Hospital Gangrene is not always of so phlogistic a character. It has been often observed to partake more of a typhoid type; and it is of the utmost consequence in practice to attend to this distinction, as it will be found, that what would be a valuable remedy in the one case, might, if carried to any extent, be very pernicious in the other. The not attending sufficiently to this circumstance, that is, to the phlogistic, or to the typhoid type of the fever, has, I am convinced, often led to fatal mistakes, and seems to be partly, at least, the cause of that great diversity of opinion among medical men regarding the best mode of treating this very dangerous affection.

"The other form in which the Gangrene usually manifests itself is more of a chronic nature; appearing then seldom in a recent wound. Most of the cases which I have seen of it have been in those of some standing, and in patients who had been long in hospital, many of whom had suffered attacks of that disease in the more acute form; after recovering from which, and when the wound was to all appearance doing well, the granulations healthy, secreting good pus, and sometimes even nearly cicatrised, a small dark-coloured spot or ulceration has appeared, most commonly on the edge of the sore, varying in its dimensions from the size of a millet-seed to that of a split pea.

"This little ulceration was, in general, of a circular shape, its edges ragged, its bottom unequal and excavated, and secreting a matter of the same peculiar smell as in the sloughing form already described. Ulcerations of the same kind not unfrequently appeared in other points, which, spreading in all directions, united, and soon extended over a great part of the wounded surface. At times, this ulceration has been known to go on, and to cause very considerable destruction of parts, without the system appearing to be much affected by it; but most frequently after it had spread to a certain extent, symptoms denoting constitutional irritation became apparent; these were, nausea and loss of appetite, thirst, foul tongue, restlessness, a small and quick pulse, and heat of skin. After the febrile symptoms had appeared, the progress of the ulceration was more rapid, and very often extended beyond the limits of the original sore; the discharge became bloody, and the fetor peculiar to this affection more offensive. Sphacelus in many instances took place, and some time before death the same train of symptoms occurred, already described as taking place in the last stage of the more acute form of the disease. This is the depascent, or phagedenic, form of Hospital Gangrene, or what may be called Phagedæna Gangrænosa.

"It would appear that, in the milder cases of this disease, the skin and cellular membrane are the parts originally and principally concerned, and that it may sometimes be confined to these textures; but that, in more violent cases, one structure is destroyed after another, so that the muscles, ligaments, and tendons, together with the blood-vessels and nerves, are involved in the disease, become disorganised, and slough off; even the periosteum is not exempt from its influence, and the bones being deprived of their covering, sometimes become affected with caries.

"Dr Walker, in his very interesting Report, already quoted in my Prefatory Remarks, says, 'It is always the skin and cellular membrane that is primarily attacked; and I have frequently seen, after a most extensive slough had separated, that the muscles had not been in the least affected, but that the cellular membrane connecting them to each other had been so completely destroyed, that they remained as if clean dissected, and might have served as a demonstration in myology. On the separation of the sloughs, bleeding was a very common occurrence, and not unfrequently, although repeatedly checked, at last wore out and carried off the patient.'

"Dr Hennen also, in his Report, remarks that 'multiplied dissections and observations on the living body, show it to be originally a disease of the skin and cellular substance (whether loose or condensed), through which it spreads to a much greater extent than on external inspection it seems to do. When these fall off, the muscles appear as florid as in perfect health, and as completely dissected as the most accurate knife could render them.' In some advanced stages, however, they also slough away, as do the bones, the cellular substance which connected the muscular fibres participating in the disease.'

"The duration of the disease varies in different individuals. If not checked by the operation of remedies, it may continue for a period of from fourteen to twenty days, or even longer; but it often terminates much sooner, sometimes as early as the third, fourth, or fifth day, either in recovery or death. When once attacked, the patient, even when convalescent, is very liable to suffer a relapse, and repeatedly, too, as I myself can testify. Lombard has seen this happen eight times in the same individual;* and Dr Hennen mentions a case in which the patient survived twelve different attacks, but sunk under the thirteenth.† Under such circumstances, it was not to be expected that they could ultimately recover; accordingly, most of those so affected, being completely exhausted, lingered for a time, and then sunk under the hectic fever which invariably attended.

"When a patient is beginning to recover from this disease, there is an abatement of the febrile symptoms; the local inflammation subsides, healthy pus is secreted, small florid granulations spring up, and the sloughs separate without being renewed. Specific sores, such as venereal, scrofulous, and variolous, are thought to be less liable to this affection than simple sores. This may, perhaps, be the case in some degree, but they are by no means altogether exempt;

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* Clinique Chirurgicale, p. 268.

† Military Surgery, p. 225.

it has been repeatedly seen to attack cancerous and venereal sores,[*] and the progress of the disease is, in some instances, quite alarming; and a case is mentioned by Dr Hennen of a soldier of the Waggon Train, who was sent into the Hospital at Bilboa, with an open bubo in the groin, and under the influence of mercury, who was carried off by this disease in forty-eight hours,—the gangrene affecting the sore almost instantly eroding the great vessels in the neighbourhood, and destroying the abdominal parietes to a great extent.[†] This case I witnessed myself."—Pp. 41–51.

Hospital gangrene is liable to affect the backs of soldiers recently punished.

"After military punishments, in consequence of neglect, improper treatment, or other causes, gangrene sometimes occurs. I have seen some frightful cases of that kind. And, from what has been stated in the description of the disease, the appearance and consequences of it may be easily imagined. Happily, however, for the sake of humanity, corporal punishments, both in the navy and army, are now inflicted with much greater discretion than formerly, and, indeed, are but seldom heard of; though it has been judged inexpedient to dispense with them altogether. In warm climates phagedæna is very apt to ensue from this cause; and it is, perhaps, not out of place here to mention, that the most effectual remedy in speedily healing wounds incidental to punishments, and, consequently, in preventing the bad effects which sometimes result from them, is the immediate application of a spirituous embrocation. The aqua ardente, a sort of brandy which was issued to the troops in Portugal and Spain, I found most beneficial in such cases: for the first twenty-four hours I was accustomed to use it undiluted, and after that time mixed with water, much on the same principle as oil of turpentine and spirituous applications have been employed in scalds and burns. But, as that was a rather expensive remedy, and could not always be had, lotions of cold water and vinegar were used instead of it, and answered very well.

"From all the phenomena of the disease, we may be warranted, I think, in considering Hospital Gangrene, more especially that form of it named Contagious Gangrene, to be a peculiar inflammatory action attacking wounded surfaces; varying in its character according to the constitution of the patient, type of the accompanying fever, and other circumstances; nearly allied to erysipelas, if, indeed, it be not a modification of that disease, and depending on a diversity of causes, as I shall endeavour to make apparent."—Pp. 52–54.

On the causes of this distemper information is not accurate. Dr Boggie considers shortly the influence of particular states of the atmosphere, inattention to cleanliness, the effects of acrid irritating applications, of stimulating food, of intemperance in the use of wine and spirits, of motion or mechanical irritation, and of specific contagion; and examines the influence real or supposed of each. All the evidence that we possess, shows that the disease prevails chiefly in over-crowded and consequently ill-ventilated hospitals, where the wounded are not provided with the requisite proportion of fresh air, and that, where this cause operates, all treatment, dietetic and medical, is quite unavailing. It may be allowed also, that hot windless weather contributes both to the formation and the propagation of the distemper; and it is most probable that improper diet and inattention to the non-naturals are accessary causes of no ordinary power.

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[*] Thomson's Lectures on Inflammation, p. 460.

[†] Military Surgery, p. 218.

On the influence of particular kinds of food and drink Dr Boggie makes the following observations :—

"It has been thought that the disease may be occasioned by a change of food, as from a vegetable diet to one consisting chiefly of animal matter; and I have myself very little doubt that it may contribute to that effect.

"The diet of soldiers, on service particularly, is very stimulating, consisting in a great measure of animal food, with a daily allowance of wine or spirits; and I have on many occasions seen, for days together, the diet made up altogether of animal, without any admixture of vegetable matter. This, to be sure, is not their ordinary fare; but it cannot fail, in my opinion, to induce a state of the system highly favourable to the production of this disease;—to men in health it may be considered a predisposing cause, and to the wounded, a powerfully-exciting cause of Hospital Gangrene.

"The diet of seamen in the navy was formerly pretty much the same as that of soldiers on service, or, perhaps, even more stimulating, for the allowance of wine and spirits made to them was greater; and we know how liable they have always been to this affection; but, in consequence of most judicious regulations made by the Admiralty Board, seamen's diet has, for a number of years past, been considerably altered; consisting now of a much greater proportion of vegetable matter, and the ration of spirits is much reduced; which cannot fail, I should imagine, in every point of view, to be attended with the greatest benefit to the service."—Pp. 63–65.

Every one who knows how British soldiers are fed, and how much stimulating liquors they take, will at once allow, that the state of system in which they are kept is most likely to concur with other causes in producing a bad erysipelatous state of wounds, when aided by impure air, in a hot season, and in certain states of the atmosphere.

The principles of treatment arising out of his theoretical views Dr Boggie unfolds in the following manner :—

"In such cases, the fever is almost always inflammatory, and will require blood-letting; but it must be proportioned to the degree or violence of the inflammation, and the age and strength of the patient.

"No precise rule can be laid down regarding the quantity to be taken; but in severe cases I have had occasion to take one, two, three, or even four pounds of blood before the inflammatory symptoms were subdued. In men, however, of a less robust constitution, who may have lingered long in hospital, or suffered much from ill health, we must act with the greatest caution. Blood-letting in such, is either altogether inadmissible, or should be used very sparingly. The same may be said of those who are the subjects of Hospital Gangrene in civil hospitals. They are, for the most part, poor people, worn out with age, or whose constitutions have been broken by poverty and hard labour; in such the disease assumes a different character, and will require a corresponding treatment. As an auxiliary to general blood-letting, Dr Trotter has proposed the local detraction, by cupping and scarifying; and though I have not employed this myself, I can see no real objection to its use. The danger of the punctures becoming gangrenous, appears to me not to be very great. The same objection has been made to general blood-letting; but though I have bled many in this disease, I never saw a single instance of gangrene supervening on the operation."—Pp. 90–92.

Dr Boggie mentions, at pp. 111, 112, and 113, the occurrence of a peculiar kind of gangrene attacking wounds, of a very malignant character, and attended with symptoms like those of yellow fever. It occurred among the French soldiers in Egypt; and it was seen at Brussels by Dr Hennen and the author. Dr Walker saw it at the Bureenia Hospital at Bilboa. Concerning this distemper we have no doubt at all. It was evidently the bilious remittent or miasmatic fever acting on the constitution and wounds of the wounded. The treatment of this form is perplexing; for while, on the one hand, bark and stimuli are indicated against the miasmatic poison; on the other, there is danger in producing too great a degree of excitement.

The treatment of the ordinary form of hospital gangrene upon modified antiphlogistic principles appears to have been in all respects satisfactory, by the powerful and favourable influence which it exerted on the disorder. The results are shortly given by the author from the records of the hospital.

"The following are three tabular returns of the Cordileria Hospital, for the months of October, November, and December 1813, which I signed as senior medical officer, when the charge of that establishment, for the time, devolved upon me.

"They will give a pretty good idea of the extent to which the gangrene prevailed, and of the comparative efficacy of the different modes of treatment that were employed.

"The hospitals at Bilboa were opened in July 1813, after the battle of Vittoria; and from that time to October following, the monthly loss at the Cordileria alone had never been below 80, and it was then, only for the first time, that the antiphlogistic treatment was introduced.

Tabular View of the Monthly Return of the Cordileria Hospital, from 21st September to 20th October 1813 inclusive, before the Antiphlogistic Treatment was established.

DISEASES.	Remained last Return.	Since admitted.	Total.	Discharged.	Died.	Proportion of Deaths to diseases treated.	Remaining.
Vulnus....	872	422	1294	384	83	1 to 15	827
Total,......	872	422	1294	384	83	1 to 15	827

Tabular View of the Monthly Return of the Cordileria Hospital, from 21st October to 20th November 1813 inclusive, when the Antiphlogistic Treatment was partially established.

DISEASES.	Remained last Return.	Since admitted.	Total.	Discharged.*	Died.	Proportion of Deaths to diseases treated.	Remaining.
Vulnus, ...	827	30	857	213	25	1 to 34	619
Total,......	827	30	857	213	25	1 to 34	619

Tabular View of the Monthly Return of the Cordileria Hospital from 21st November to 20th December 1813 inclusive, when the Antiphlogistic Treatment was fully established.

DISEASES.	Remained last Return.	Since admitted.	Total.	Discharged.	Died.†	Proportion of Deaths to diseases treated.	Remaining.
Vulnus,...	619	172	791	67	6	1 to 131	718
Syphilis,	...	5	5	...	...	......	5
Total,......	619	177	796	67	6	1 to 131	723

—Pp. 117–119.

Thus it appears, that during the treatment by means of wine, bark, and nutritious food, the mortality was 1 in 15, which is 6·6 per cent., or 66 in 1000. In the first period of the antiphlogistic treatment, the mortality fell to 1 in 34, or rather less than 3 per cent. In the third and last period, it was 1 in 131 of those treated, or less than one per cent.

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* Of this number, 59 affected with gangrene were transferred to another hospital.

† The deaths which occurred this month were rather from exhaustion and hectic fever than from gangrene.

This demonstrates in an unequivocal manner, the great superiority of the antiphlogistic method of treatment. At the same time, we feel confident that the first and most indispensable measure is to disperse the wounded men over a more extensive space; to place only small numbers in one ward and one hospital; to have the hospitals small, separate, and well ventilated; and where small separate hospitals cannot be obtained, to treat the wounded in tents and separate houses.

Dr Boggie, it is impossible to doubt, is the author of a great improvement in the pathology and treatment of hospital gangrene. His treatise is written with great sense and judgment, and is certainly the most instructive on that subject in the English language. That the author of such a performance has not for thirty years been on actual duty, and has so long been left to enjoy, without promotion, the dignified retirement of half-pay, is the most severe censure that can be pronounced on those in authority.

In an appendix are given various cases illustrating the beneficial effects of the antiphlogistic treatment in other diseases.

ART. IV.—*A Treatise on Diet and Regimen.* By WILLIAM HENRY ROBERTSON, M. D., Physician to the Buxton Bath Charity. Fourth Edition, rewritten and much enlarged. Vol. II. London, 1848. 8vo. Pp. 362.

THIS second volume, which completes the work of Dr Robertson, directs the attention of the reader to subjects different from diet, but not less important in their influence on the preservation of health.

The subjects which the author considers in the present volume belong to that division of the science of hygienics which treats of what former physiologists denominated the non-naturals. These are, in the first place, exercise; secondly, the influence of ventilation and climate; thirdly, the hygienic effects of clothing; in the fourth place, the physiological and prophylactic effects of bathing at different degrees of temperature; in the fifth place, the effects of mineral waters on health; in the sixth place, the effects of sleep; in the seventh place, the effect of occupations of different kinds; and lastly, the influence of mental cultivation.

The fourth chapter, in which are considered Ventilation, Climate, and Change of Air, gives an instructive view of the best ascertained facts on the sanative influence of these agents, the necessity of the first in preserving health, and of the two last in restoring it when impaired; and ought to be read with much interest. The effects of climate on the human frame and its functions, though operating in a slow and imperceptible manner, are so remarkable, that they naturally engross great attention. On this subject Dr Robertson gives a short view of the adaptation of different places in Great Britain, and on the Continent as residences for invalids. He justly cautions against the coasts of the Mediterranean for phthisical persons; and unquestionably, all experience almost is opposed to the idea, that any part of the south of Europe is a good station for persons with pulmonary disorders.

Next to change of climate may be placed change of air as an agent of considerable influence in improving health under certain circumstances. It is certainly not so much the change in temperature in this case, as the change from an impure to a purer atmosphere, that produces the effects observed. The great matter, in whatever change is effected, is for the invalid to be constantly, or at least as much as possible, in the open air.

It is the common effect both of change of climate and change of air, that, in ordinary circumstances, the mind is either unoccupied, or is more or less delivered from those causes of irritation which powerfully contribute to derange assimilation and impair health. The effects of this, in the treatment of various disorders, are not forgotten by Dr Robertson.

In the seventh chapter is presented a short but useful sketch of the principal mineral springs, cold, temperate, and hot, in France, Germany, Italy, and England. The information given will not enable invalids, in all cases, to select the proper watering-place suited to their complaints; but it will show them, that it is of great moment, in order to ensure the sanative effects of mineral waters, to consult a well-informed and judicious physician.

In these islands, in which every one anxious to improve his condition, works as indefatigably as mind and body will allow, and sometimes more than they permit, it is of little avail for physicians to impress the injurious effects of overwork either of body or mind, or of occupations directly injurious to the welfare of both. The truth is, that the baneful effects of many pursuits and occupations, and many practices and modes of living by which they are attended, are well known; because they are matters of common observation. Knowing the right we pursue the wrong. At the same time, let whoever has leisure to spare from the engrossing pursuits in which he is involved, peruse the ninth and tenth chapters of the present volume, and he will learn that it is more important to preserve health than to be wealthy, and that in educating his children, he should take care that their mental faculties are not taxed beyond their powers.

PART III.

MEDICAL INTELLIGENCE.

PHYSIOLOGY.

On the Chemical Constitution and Physiological Properties of the Saliva of the Horse. By M. MAGENDIE. (Seances de l'Academie R. des Sciences, 20 Octobre 1846, et Archives G. de Medecine, 4 serie, vol. ix., 1845.)—In a memoir presented to this body by M. Magendie as member of a commission, *on the parotid saliva* and the mixed saliva of the horse, in reference to its chemical composition and physiological action on food, are the following inferences.

The parotid saliva in the horse is a transparent, colourless, inodorous, very alkaline liquid, owing the last-mentioned property to the presence of a large amount of bicarbonate of potass. One thousand parts of saliva contain from ten to eleven of dry (solid) matter.

Examined by the microscope, parotid saliva filtrated, shows no body possessed of any definite form. There are seen only some white amorphous flakes, consisting of carbonate of lime and a little organic matter. These results are accordant with those previously published by Messrs Tiedemann and Gmelin, Leuret and Lassaigne.

The dry residue left after the evaporation of parotid saliva consists of from 33 to 53 per cent. of mineral salts, which are chloride of potassium and carbonate of potass in large quantity, a little phosphate and carbonate of lime, with traces of phosphates and alkaline sulphates.

The organic products are albumen, a matter soluble in alkohol, and a matter insoluble in this agent, but soluble in water. The last, which is ptyaline, retains chloride of potassium in combination. The proportion of albumen amounts to one-fifth of the solid mass. In this respect the new analysis of the parotid saliva of the horse differs considerably from those which have preceded it, and according to which the principle now referred to is represented to be in quantity scarcely appreciable.

It does not appear that the parotid saliva of the horse contains alkaline sulpho-cyanide ready formed. This compound appears when the fluid is in a state of alteration.

Parotid saliva has no action on paste of fecula and on crude fecula at the temperature of from + 40° up to + 75°.

When a fistula is made in each parotid duct in the horse, at the end of some time the composition of the saliva is sensibly modified. There is observed sometimes a diminution in the amount of the solid matters; but the organic substances always undergo progressive diminution. From 50 per cent. of dry saliva they are reduced to 4 per cent.

Mixed saliva is the result of the mixture of all the fluids poured into the mouth during mastication. This mixed saliva is obtained in a state of purity by making the horse eat after an opening has been made in the œsophagus, bran which had been washed first in cold water, then in boiling distilled water. Each mass of masticated bran moistened with saliva and swallowed was received by the œsophageal opening; and the saliva with which it was impregnated was withdrawn by pressure.

This mixed saliva is a grey yellowish liquid, moderately clear, easily becoming turbid. It is slightly alkaline, and contains no carbonate, but a large amount of alkaline chloride. Examined by the microscope, it presents many rounded transparent minute globules. One thousand parts contain about ten of dry matter.

The dry residue is composed of forty per cent. of mineral salts, namely, a very large proportion of chloride of potassium, a little phosphate and carbonate of lime, traces of alkaline carbonate and phosphate, and a little chloride of magnesium.

The organic products are the following:—a substance soluble in alkohol, nd having the same properties as its analogue in the parotid saliva; a ʼubstance insoluble in alkohol and soluble in water, different from the corresponding substance in the parotid saliva; lastly, a matter coagulable by heat, and which is not entirely albumen. It does not contain alkaline sulpho-cyanide ready formed.

Like the saliva of man issuing from the mouth, the mixed saliva of the horse immediately converts into sugar paste of fecula, at the temperature of + 41°. At the same temperature it has a slow but sensible action on crude fecula and on coagulated albumen.

The differences observed in the composition and in the action of the parotid saliva of the horse, and those of the mixed saliva collected in the mouth of the same animal, deserve the more strongly to claim attention, that, in recent times, physiologists have represented the saliva of man and that of the horse as differing from each other. On comparing, however, parotid saliva of the horse with that collected in the mouth of the human subject, it was by implication admitted, either that the fluids poured into the mouth by the other glands had the same composition as the parotid liquor, or that they were in amount so small that they might be neglected.

These two hypotheses are inadmissible. The mixed saliva differs, as has been seen, in chemical composition, from the parotid saliva, and, further, the division of the parotid ducts only diminishes by about one-sixth, the quantity of the fluid with which the animal moistens the alimentary mass. Observers have therefore erroneously compared with each other, and distinguished from each other the saliva collected in the human mouth, and that supplied by the parotid ducts of the horse. If, instead of thus proceeding, they had paid attention to the properties of the varieties of saliva issuing from corresponding sources, they could not have failed to recognise in these the greatest analogy.

According to these facts, saliva acts not only as a solvent of certain parts of the alimentary articles; it performs, in truth, a useful part in the first stage of digestion, and this fact is exactly that which has been made known by the labours of several chemists and physiologists of the present time, among whom may be mentioned as principal, MM. Mialhe, Bouchardat, Sandras, and Lassaigne.

These observations, with the experiments given in page 245 on the part performed by saliva in digestion, and those in page 246 on the normal presence of sugar in the blood, lead to important conclusions as to the function of assimilation and nutrition. When we consider the large proportion of amylaceous articles that enter into the composition of human food,—bread in various forms, various farinaceous articles, potatoes, rice, and the different cereal meals,—it seems natural to think that much of those substances must furnish to the blood either starch or sugar, which are in several respects convertible articles. This is still more decidedly the case with graminivorous, herbivorous, and granivorous animals. On the other hand, neither starch nor sugar forms any part of the solid texture of the animal. It must follow, therefore, that these amylaceous substances are conveyed into the system along with the albuminous and gelatinous, and though not in themselves nutrient, are the means of presenting the nutrient principles to the blood and textures.

Were it allowable to speculate on the purposes or final causes of this arrangement, as to the nature and composition of alimentary articles, the following considerations may not be unseasonable.

While the food of man and animals consists of articles which contain, in various proportions, starch, sugar, albumen, gelatin, lignin, and water, it appears that, in order to insure healthy nutrition, these articles must be presented together in certain proportions, and must not be presented separately. Neither man nor animals can live and enjoy health on any one of these articles singly; but by the substances in which they are united, both man and animals are maintained in health and strength.

Starch, or *fecula*, (amidine) appears to be too low a substance to maintain the health and strength of animals alone. It requires to be combined with a little albumen, as in the various flours and meals of the cerealia and of the leguminous grains. Albuminous articles, as the fine flour of wheat, the flesh of animals, are too highly azotized as it were, and seem always to overcharge the system with nitrogenous principles, except in the case of the carnivorous animals.

Sugar, as it is presented with starch in the amylaceo-saccharine vegetables and roots,—as potatoes, arrow-root, salep, parsnips,—seems to be nutritious and salutary; and even the mucilaginous-saccharine roots,—as carrots, turnips, radishes, and beet-root,—sustain life, though less perfectly than potatoes. Pure sugar, nevertheless, is hurtful; and the more completely it is isolated from the starchy and mucilaginous principles with which it is associated in nature, the more hurtful it is. Thus, while saccharine plants sustain life, pure sugar cannot do so, and is known to induce disease. It is against this form of sugar—the pure crystalline—that Dr Prout speaks so strongly, as an article always injurious to the economy. Lignin, again, is alone quite inadequate to sustain life; but if mixed with the albumen, fecula, and caseine with which it is naturally associated in the grains of the cerealia, it appears to be not only not hurtful, but beneficial and even necessary. Hence the advantage of bran in wheaten bread, and of the seeds of the oat in moderate proportion in oatmeal.

It may be justly said that all the attempts to separate the principles of human food, and present them in what are called highly-concentrated and refined forms,—as refined flour and bread baked from refined flour, refined or highly-crystallized sugar, concentrated albumen, and concentrated gelatin,—are, as general practices, injurious. Occasionally they may, under certain circumstances, be requisite; but for general use, all articles of food are most salutary and most useful as near as possible in the form in which they are presented by nature.

MATERIA MEDICA.

Narcotic Principle in Indian Hemp, a Peculiar Resin. By Messrs T. & H. Smith, *Edinburgh. (Pharmaceutical Journal).*—The researches of these chemists show that the remarkable action of Indian hemp on the animal economy depends on the presence of a particular resin, which is soluble in alkohol, and from which it is precipitated by water in the form of a white powdery substance.

This resin obtained, by means of a process described by the authors, is of a yellowish-brown colour. It has a hot, pungent, balsamic taste. Heated on a plate of platinum, it melts and burns away without leaving any residuum, diffusing a strong aromatic odour.

Messrs Smith found, by experiments made on themselves, that this substance possesses soothing and hypnotic properties of morphia. In the dose of two-thirds of one grain English, it is a powerful narcotic; in the dose of one grain, it produces complete intoxication.

Under its influence the pupil is contracted. Its action is very persistent; but it does not appear, like opium, to have the inconvenience of producing constipation.

To this resin, of which the plant contains from 6 to 7 per cent., the various preparations used in the East, as haschisch, &c., owe their well-known properties.

PATHOLOGY.

Influence of Newly-formed Marshes on the Diseases and Mortality of a Limited Population. By M. Dolfus-Ausset (*Journal de Pharmacie, 3ieme Series, T.* xii., 1847. Juillet).—A remarkable example of this influence, in a hygienic point of view, is given in a note presented to the Institute, on the 5th of May 1847, by M. Dolfus. The inhabitants of two peaceful districts of Alsace enjoyed a satisfactory sanitory state up to the year 1844, when all at once the railway from Strasbourg to Bale was carried through these quiet valleys. Considerable embankments were executed in the line of these valleys; enormous masses of earth were raised, leaving in their place numerous excavations. In those receptacles water was quickly accumulated, and they were converted into marshes. The influence of the miasmata thus engendered by the stagnating waters and exhaled from them on the health of the inhabitants of the adjoining grounds, was soon evinced. This the numerical results obtained by M. Dolfus show in a deplorable manner.

In the Commune of Bolwiller, which contains 1446 inhabitants, the persons attacked by intermittent fever had been previously to the construction of the railway, that is,

			Patients.
	in 1842		36
Since that period they rose,	in 1844	to	166
	in 1845	to	743
	in 1846	to	1166

The average mortality for 10 years, previous to the construction of the railway, was . . . . . 36 persons annually.

The average mortality was, in 1846 54 „

In the Commune of Feldkirch, of which the inhabitants amount to 1450, the following numbers show the cases of ague for the respective years—

	Cases.
1843	2
1844	20
1845	135
1846	376

The annual average mortality rose from 11 to 18 in 1846.

These statistical facts show decidedly the great influence which the soil may exercise on the sanatory condition of populations. It points out also a great defect in the laws which regulate the construction of such roads. M. Dolfus thinks it clear that the State, or the company who have in this manner by extensive earth-works introduced into the heart of two parishes so severe an infliction as endemic fevers, ought to be compelled to drain, at their own expense, the marshes which they have formed, and thus dry up the sources of the miasmata, which act like poisons on a population of 3000 souls.

Analysis of an Osteo-sarkoma observed at the Marine Hospital at Brest. By M. Roux. (Journal de Pharmacie, 3ieme serie, T. xi. p. 429.)

Physicians who have studied diseases of the bones have hitherto furnished few considerations on the chemical composition of *osteo-sarkoma.*

M. Lobstein, the author of a Treatise on Pathological Anatomy, cites only the analysis of a liquor obtained from the centre of a cancerous degeneration of the *os femoris.*

Desirous to furnish some considerations on this subject, M. Roux made the analysis of an *osteo-sarkoma* removed by M. Reynaud, chief surgeon to the marine force, from a young commissary of the administration.

The tumour was situate in the upper part of the *humerus*, the relations of which it changed. Its shape was oval, depressed, and as if bilobated at the posterior part. Its weight was about 1680 grammes, that of the whole bone 1770 grammes. The tumour was 25 centimetres high, and 14 centimetres in diameter. Its large vertical circumference was 65 centimetres, and its horizontal circumference 36 centimetres.

The *osteo-sarkoma* was surrounded by a fibrous layer continuous with the end of the bone, of which it appeared to be the periosteum. This investment was thin, little resisting, incrusted towards the part corresponding to the head of the humerus, with a bony plate from one to two millimetres thick.

The interior presented cells irregularly-hexagonal, circumscribed by blood-vessels. From this, slight pressure separated numerous granulations. The tumour grated under the scalpel; its consistence was cartilaginous, its colour grayish, its aspect marbled. Its texture was furrowed throughout with streaks of phosphate and carbonate of lime.

A thin slice of the *osteo-sarkoma* examined under the microscope of M. Raspail presented the appearance of coagulated white of egg, or mucilage of gum tragacanth. The opacity of the mass is in various points interrupted by cells and reddish flakes of fibrin contained in the furrows surrounding the cells.

The microscope of Oberhauser showed in this tissue myriads of *utriculi* or bladders filled with liquid; and the union of these gave the tumour its characteristic opaque tint.

The composition is represented by the following proportions of substances:—

Water,	87.86
Cartilage passing to the state of chondrine,	9.85
Albumen,	0.30
Stearine, margarine, and phosphated fat matter	0.28
Carbonate of lime,	0.67
Phosphate of lime,	0.59
Sulphate of soda and sulphate of potass,	0.21
Carbonate of soda,	0.14
Chloride of sodium and of potassium,	0.10
Phosphate of magnesia, of alumina, of silica, and of iron,	traces.
	100.

The large proportion of water is easily explained, if it be remembered that microscopic examination demonstrates the sieve-like mass of cells. These cells being filled with fluid, distend the tissue of the tumour, make it a sort of sponge, and give it its peculiar aspect.

Another observation flows from the analysis, the results of which are now given. Under the influence of the cancerous affection a remarkable phenomenon is produced. The bone losing gradually its inorganic framework, retains only the cellular network, the development and degeneration of which constitute the tumour.

The elimination of the calcareous materials appears to have for its cause the formation of an acid in the organism. The hypothesis, whether it might be interesting to try in a like disease the administration of alkalis, the author submits to physicians.

On Change of the Blood in Scurvy, (Journal de Pharmacie, 3ieme Serie, T. xii. Paris, 1847.*)*—For two centuries, all authors who have described scurvy, Broussais excepted, have represented this disorder to be the result of disease of the blood. Three periods may be noticed as distinguished for different hypotheses on the nature of this disease in the blood. During the first period, which extends from the middle of the seventeenth century to the year 1804, the physicians who examined the blood of scorbutic patients were obliged to be satisfied, from want of the means of correct analysis, to direct attention to the physical properties of this liquid, without being able to penetrate the exact nature of its alterations. Thus Eugalenus in 1658, one of the principal authorities at that time, observes that the colour of blood drawn from the veins of scorbutic patients is gray or greenish; and Boerhaave and Van Swieten, as well as Hoffmann, remark the singular aspects which the fluid assumes in a state of dissolution.

Lind and Huxham described accurately the softness, the friability, and the defect of coagulation observed in the blood of scorbutic patients. "This liquid is brown, violet, black like ink;" and throughout the writings of these authors and their cotemporaries, are found such expressions as "blood dissolved, decomposed, state of dissolution of the blood," when that of scorbutic patients is mentioned.

The second period, that in which chemical analysis of the principles of the blood and their modifications was substituted for the rude inspection of this fluid, begins with Deyeux and Parmentier. These two chemists having analysed the blood of three scorbutic patients, remarked that this fluid was neither more nor less coagulable than ordinary, but that its albumen showed itself more coagulable by heat. They ascertained, also, that the blood had not its wonted odour.

Afterwards, in 1837, M. Magendie endeavoured to prove, that scurvy is produced by diminution of the fibrin of the blood, and by increase in the alkaline state of that fluid—alterations which communicate to it the characters denominated those of dissolution. But this physician did not analyse the blood of scorbutic patients. He satisfied himself with producing in animals an artificial scurvy, by injecting into their blood-vessels defibrinous blood, or blood charged with subcarbonate of soda.

The subsequent year, M. James, his pupil, having caused the blood of a scorbutic person to be analysed by M. Fremy, and this liquid having shown itself poor in fibrine, and very rich in alkali, M. James having further shown that the blood of scorbutic persons coagulates imperfectly, and that the clot which it forms is soft and friable, thence concludes, 1st, that, in scurvy, the blood is deficient in coagulability; and, 2d, that this deficiency in coagulable power appears to depend on a diminution in fibrine, and an increase in the amount of the alkaline principle.

In 1841, M. Andral having had occasion to take blood twice from a scorbutic person, found that the blood drawn presented a remarkable diminution in fibrin (1.6 per 1000), a diminution in globules, and an excess in alkalinity. These analyses confirmed in a wonderful manner the ideas entertained by the older physicians. They had anticipated the diminution in one of the coagulable principles of the blood, and the unusual increase of alkalis which this liquid in the normal state contains. To these morbid states, separately or combined, was ascribed that dissolution, that putridity of the blood, so correctly described by Lind and Huxham.

M. Andral did not hesitate indeed to infer that the hemorrhagies which are produced in scurvy, purpura, and severe fevers, are manifested under the influence of a diminution in the fibrin of the blood.

M. Andral observed also, that it is in the blood of the scorbutic that the maximum of alkali in the free state is recognized.

Both induction and experimental research, therefore, were united in establishing definitely the correctness of the ancient etiological theory of scurvy, when MM. Becquerel and Rodier having analysed the blood of five scorbutic persons, arrived at results which appear to invalidate the prevailing doctrine. These chemists, indeed, established the following inferences:

1. That, instead of presenting itself in the state of dissolution, as the theory admitted generally ought to suppose, the blood in five cases presented a firm clot well detached.

2. That the density of the defibrinated blood was in all the cases below the normal average. Further, this diminution in density, specified in five cases, was not in relation with the respective proportions of water and the solid constituent matters of the blood.

3. That the quantity of globules was always smaller than the physiological average.

4. That the fibrine had undergone diminution in no case.

5. That no fact has been able to show in the blood the presence of alkaline substances in excess.

Shortly after the publication of this memoir, M. Andral communicated to the Institute an analysis which he had recently made of the blood of a scorbutic person. In this patient, the fibrine was remarkably increased (4.4 in 1000), as well as the water (874. in 1000). The globules alone had diminished, (44. in 1000). From this, M. Andral concluded that an attack of scurvy, well marked, may evince its presence without there being diminution in the fibrine of the blood, and also without this liquid presenting traces of dissolution.

Perhaps M. Andral has renounced rather hastily the theory which he had explained in a manner so ingenious and striking. Indeed, the scorbutic person whose blood he examined, was under an attack of a violent pulmonary congestion with fever. The rise in the numerical amount of the fibrin was probably accidental, and caused by an attack of intercurrent *bronchitis*; for it has never been asserted, that, in scorbutic patients, the fibrin may not, under the influence of an inflammatory attack, exceed the normal amount.

Ought it to be admitted as a fact positively demonstrated, that everything advanced regarding the influence of the diminution of fibrine and the increased alkalinity of the blood upon hemorrhagic diseases is to be erased from treatises on medicine? This is probably unnecessary. The analyses of MM. Becquerel and Rodier deserve most attentive consideration. But they do not destroy the value of those which, performed previously, had furnished an opposite result; for instance, that of M. Fremy, one of those of M. Rodier's, and the first two of M. Andral.

The author of these notices, when internal or resident pupil at the Salpetriere, in 1837, had occasion to examine the bodies of two aged scorbutic females, in whom the disease was of long continuance and very well marked. With both, there were scorbutic *caries* of the bodies of one or several *vertebræ*, infiltrations of blood beneath the serous membranes, the mucous membranes, and in the intermuscular spaces. In one of these cases,—the only one which he could examine with care,—he remarked that the heart contained a considerable quantity of blood, which was extremely fluid. It is probable, he thinks, that, in the cases examined by MM. Becquerel and Rodier, and in which the blood was very coagulable, the disease was considerably less severe, less inveterate, and presented a peculiar character. The proof of this is, that scurvy was prevailing, as it were epidemically, at the Salpetriere, at the period at which these chemists made their analyses. He thinks, therefore, that before reconstructing on a new foundation, the theory of scurvy, of purpura, and the passive hemorrhages, it is requisite to collect facts more numerous, and obtained under the most different circumstances.

On the Use and Abuse of Anæsthetic Agents, and the Best Modes of Rousing Patients who have been too intensely affected by them. By James Braid, Esq., M. R. C. S., Edinburgh, C. M.W. S., &c. (Medical Times, communicated by the Author.)—Of all the revolutions which ever took place in regard to any medicinal agent, nothing so eventful was ever known as what has been evinced in the fate of anæsthetic agents. Their advent was hailed with universal enthusiasm, and seemed to be followed by unalloyed success. By their agency a second Eden seemed to be dawning on fallen man; pain and peril were no longer to be the lot of those doomed to undergo surgical operations; and parturient women exulted in the assured confidence that they were redeemed from the pains and penalties of the primal curse, through the omnipotent powers of ether and chloroform.

The rapidity with which these potent agents attained their culminating point of fame and favour is most remarkable; and not the least surprising point, in my estimation, was this, that their almost universal adoption, and in many instances their being applied apparently with little care or caution, took place without the occurrence of dangerous or fatal accidents. For a considerable period all seemed a run of unalloyed success. But the tide has now turned, and instances of disaster and death are recorded as such frequent occurrences from the use of chloroform, as must soon issue in the entire abandonment of this agent by the profession, and the insurmountable dread of it by the public, unless we can arrive at some satisfactory solution of the true cause of the late unfortunate results, and determine the principles which ought to guide us in its future administration, so as to ensure the blessing without the curse, of an agent which seems to be alike potent for good or for evil, according to the mode in which it is administered.

I cannot conceive that chloroform is necessarily such a dangerous and fatal agent, and one which ought, as such, to be entirely abandoned, as many seem now inclined to recommend. If it is so, how came it to have been so harmless in thousands of instances at its first introduction, and so frequently fatal now? This cannot arise from any change in the agent, or in the patients operated on; I, therefore, consider that the great danger and disasters lately experienced have arisen from the general success which was realized at the commencement of the use of chloroform (as well as that of ether) having rendered us too bold and careless in the use of these potent agents; and, now that an alarm has been excited as to the danger, that the emotional feelings of the patients have been adding greatly to the danger of applying them. I beg leave, therefore, to offer a few remarks on this interesting subject, which may not be altogether out of place, inasmuch as they only confirm the propriety of the points which I ventured to suggest on the use of ether—and which are equally applicable as regards chloroform—in the *Medical Times* of the 27th February and 10th of April 1847. Had these suggestions been carefully attended to and acted on, I doubt not but many of the unfortunate cases might have terminated otherwise. This much, however, I have the gratification to state, that I have always exercised the cautions there suggested, both as regarded declining their use in such cases as I considered contraindicating it, as also in always testing the susceptibility of patients to the influence of the anæsthetic agents before important operations, so that I might know the genuine effect of the cautious application of the remedy when the patients were entirely free from mental emotion regarding an operation about to be performed. The consequence has been that, although I have used both ether and chloroform very frequently—the latter, in conjunction with Dr Hilbers, for six hours continuously in one case (that of a lady of extreme delicacy and in imminent danger), and for several hours each night for some nights thereafter—yet I have never met with any bad results in any of my patients, traceable to the application of the remedy, but the contrary. Indeed, this latter patient could not have lived over the first night on which it was tried, had it not been for the marvellously beneficial effects of the chloroform in her case.

At page 11 of the *Medical Times* for the 27th of February 1847, relative to the use of ether, I said, "I do not consider it applicable to all cases indiscriminately. The use of such a potent agent evidently requires caution in many cases, whilst in others it is altogether contraindicated. I consider nothing could be more indiscreet than bringing the system fully under its influence in certain forms of cerebral disease, as well as in various disorders or diseases of the heart and lungs. In some patients, moreover, it produces much excitement in the first instance, and is long in producing unconsciousness and total loss of feeling. In certain cases this may arise from idiosyncrasy, but it appears to me that much also depends on the rapidity with which the ether is absorbed through the bronchial membrane. Where this takes place slowly, excitement is likely to result in the first instance; but where it takes place rapidly, the blood becomes quickly surcharged with the hydro-carbonaceous compound, and the narcotic effects speedily manifest themselves, and that without any marked state of primary excitement. This is what, *à priori,* we might expect, and has its analogue in the progressive symptoms of intoxication induced from slowly sipping wine or spirits and water, which produces excitement in the first place, and depression subsequently; whereas the sudden ingestion into the stomach of a large quantity of strong liquor is speedily followed by stupor of the most intense and sometimes fatal nature, without having produced any corresponding or marked primary symptoms of excitement.

"My own rule is this—and I think myself warranted in recommending its adoption by others—always to test the susceptibility of each patient to the influence, once or twice (now I would recommend it more frequently) before the time when the operation is to be performed. By this means much useful knowledge is acquired regarding the idiosyncrasy of the individual case, alike valuable to the operator and patient during the important crisis of the operation."

I then adduced an interesting example of this, where the case succeeded admirably, but in which I had good reason to conclude that the result would have been very different had I not taken the precaution of testing the patient repeatedly before the day of operation, by which a tolerance of the ether was engendered, as well as a knowledge acquired of the exact extent to which it required to be carried before commencing the surgical operation, which was the extirpation of a mamma. The patient, who was a very delicate woman, recovered beautifully, and is in excellent health now.

The following remarks on the physiological effects of the ether, which were made in refutation of the erroneous notions put forth in one of the leaders in the *Lancet,* and which was lauded by other writers in the same publication, I also beg leave to quote from my article in the same page of the *Medical Times*:—"Those who allege that tetanus and hydrophobia are not likely to be benefited by ether, because they are diseases of motion and not of sensation, and because the excito-motory system becomes more mobile or irritable in proportion as the functions of the cerebrum become depressed, prove by such remarks that they only partially comprehend its power. The first symptoms seem undoubtedly to favour that interpretation; but let it be carried sufficiently far, and the functions of the medulla oblongata and true spinal marrow will also become implicated, so that the action of the heart and lungs may be so impaired as to endanger the patient's safety from asphyxia; and general muscular irritability may be so suspended or impaired as to afford no indication of reflex action on the application of the galvanic current. No doubt some diseases of morbidly exalted feeling—*e.g.* the whole of the painful neuralgiæ—may be more readily affected and benefited by it; for it is an undoubted fact that, both by hypnotism, mesmerism, and ethereal narcotism, the first indications are in the sensorium, and that the sense of pain may be gone whilst consciousness remains: so that the patient may be sensible to temperature, sound, smell, and sight, in some cases where there remains no distinct sense of pain from severe inflictions, such as pricking, pinching, and cutting. Still we have only to increase the means, and the whole functions of the nervous system will be depressed or temporarily suspended."

In the *Medical Times* for the 10th of April 1847, pp. 130, 131, I have adduced another interesting case to prove the propriety and advantage of experimental trials of the anæsthetic agent prior to the day on which the operation is intended to be performed. Nothing could be more satisfactory or conclusive on this point than the results realized in this case. At the conclusion of that paper, I made a few deductions from the premises, the substance of which I shall here repeat as equally applicable to chloroform, and which now, as then, I would beg leave to urge in the most earnest manner on all who mean to pursue the use of anæsthetic agents in future.

1. That no operation should be attempted under the influence of anæsthetic agents without a number of preparatory experimental trials having been made prior to the day of operation.

2. That the vapour breathed at first trials should be much diluted, and the strength gradually increased, so that the proper strength and quantity should be determined on for each individual case prior to the day of operation.

3. That, when any circumstance may render it necessary to perform the operation without delay, it should rather be done with the risk of slight manifestation of pain to the patient, than be carried so far as to endanger his ultimate safety.

4. That the anæsthetic agents should always be inhaled in a diluted form at first, so that the respiratory organs may become tolerant of them in that state, before they are applied in such a concentrated form as may be requisite to narcotize a patient sufficiently for an operation.

5. That in no case should the narcotizing influence be carried, immediately preparatory to an operation, beyond that stage which previous trials have proved is readily recovered from.

6. That in protracted operations the patient should be made to breathe a less concentrated form of the vapour after the first incisions, or the concentrated vapour and pure air alternately, in such proportions as may seem requisite to keep the patient slightly under its influence, but carefully guarding against inducing such degree of collapse as might seriously interfere with the function of respiration; for this reason, that, if the respiration becomes seriously depressed or suspended, we have no certain means of rousing the patient and removing the impending danger, as it is through the lungs chiefly that the anæsthetic agent is eliminated from the blood.

7. That an operation should never be undertaken when the patient is only so partially narcotized as to be capable of feeling acute pain, as in such condition, with many patients, the pain and emotion and shock to the nervous system are likely to be far greater than if they were in their natural state.

8. That patients labouring under grave diseases, or disorders of the brain, heart, or lungs, ought not to be subjected to the influence of anæsthetic agents at all, or only slightly so, and with great caution.

9. That in no instance should a female be narcotized without a third party being present.

I feel pretty confident that, if these recommendations had been strictly complied with, we should not have been shocked by reports of deaths from chloroform, day by day, as has been the case for some time past. An occasional coincidence might occur, as every medical man knows that sudden death may happen sometimes subsequent to the most trifling operation, or, even before the operation, that patients have died from mere mental emotion. Such instances, however, are happily rare occurrences, and cannot account for the late frequent fatal results after the use of chloroform. Such results, therefore, are more probably due to some mismanagement in the administration of the chloroform. A remarkable fact in support of this opinion is the great success of Dr Simpson, the first applier of chloroform as an anæsthetic agent. He has tried it most extensively for suspending the pain of parturition as well as surgical operations, but we hear of no fatal results occurring in his hands. Experience has no doubt proved to him that during labour (in which he uses it chiefly) the best method is to keep the patient only partially under its influence, because, if too profound, the labour-pains are thereby entirely suspended; whereas, with a smaller dose, suffering is subdued, whilst the labour goes on more vigorously than if the patient were in the natural condition.

It is an undoubted fact, that highly excitable, nervous, hysterical, and epileptic subjects are liable to be more intensely affected than those of a different temperament and condition of body. I have proved, however, that even such cases can be brought under the full influence with impunity, provided sufficient caution is used not to do so too rapidly. No more striking instance in point could be adduced than that of the patient referred to in the third paragraph of this paper, as that patient had had several epileptic fits, one in the afternoon and another in the evening of the night when I first subjected her to the influence of the chloroform; and yet, as already remarked, I sat by her bedside, and administered it cautiously and repeatedly, so as to keep her decidedly under its influence for six hours continuously, with the most marvellously beneficial effects, as can be certified by Dr Hilbers, and Mr Batty, surgeon, as well as the whole family. In these ticklish cases, therefore, we must just manage with a correspondingly greater degree of care and caution than is required in ordinary cases.

I do not wish to advert to any of the fatal cases in particular, but I will venture to hazard the opinion, that, in such unfortunate cases, more good would have been done in restoring the patients by blowing briskly in their faces, and on their necks and chests, with a pair of common bellows, than from all the remedies recorded as having been tried, and usually resorted to in such cases. The cold air from the bellows, impinging on those parts of the skin supplied with the respiratory nerves, does more to rouse the respiratory function, which is the most potent remedy in such cases for rescuing the patient from impending danger and death, than any other means I know. It is also the most certain and speedy mode of rousing patients from epileptic fits—a fact which cannot be too generally known.

Should this method not speedily succeed in exciting the function of respiration, recourse ought immediately to be had to artificial respiration, aided by galvanism, if a battery is at hand and in readiness, applied so as to excite the function of the heart and lungs. Also friction with stimulating applications, such as tincture of capsicum, ammonia, turpentine, mustard, &c., over the chest and precordial regions, with sp. am. aromat. in water, or brandy and water, which should be conveyed into the stomach by the aid of an elastic tube, so as to guard against the danger which might arise from their entering the larynx and trachea during the state of profound narcotism.

At page 382 of the *Medical Times* for 13th February 1847, when writing on the relative value of mesmeric and hypnotic coma and ethereal narcotism for the mitigation or entire prevention of pain during surgical operations, I said the great recommendation of the ether method is "its greater rapidity in inducing the required coma, and the greater number of patients who may be thus rendered entirely unconscious, than by the mesmeric or hypnotic process. In such cases, however, as can be readily sent deep enough into the sleep by these processes, I should decidedly prefer this method, as the patient is less likely to experience after-inconvenience from mesmeric coma than from inhaling the offensive narcotizing fumes of sulphuric ether. The same remarks apply to chloroform. Moreover, certain states of constitution or of general health will contraindicate the application of the ether and chloroform. The late fatal results with anæsthetic agents give still greater importance to the relative value of mesmerism and hypnotism for such purposes. I have tried it myself with complete success in a number of cases; and it has been tried by others, most extensively so by Dr Esdaile in India, in hundreds of cases, with the greatest success, and in no case with fatal results; so that, as Dr Storer justly remarks in your last number, it is high time and but reasonable to expect that medical men should now devote a little more attention to what, if not so speedy and certain, is, nevertheless, in many cases, a successful method of allaying the pain of operations, and also of curing disease, whilst it has this great recommendation, that if it does not succeed in what was aimed at, still it cannot be alleged that it kills the unhappy patient, as has lately so frequently happened from the use of chloroform.

There is one point more to which, in conclusion, I wish to direct especial attention, because it is of great importance, and is not likely to be generally understood, namely, that both during mesmerism and hypnotism, and the narcotism induced by anæsthetic agents at a certain stage, whatever muscles are called into strong action, especially under strong emotional feeling and the notion of resistance, are liable to become cataleptiformly fixed, and may remain so to the destruction of life if the glottis is thus closed as by the cadaveric spasm. In such case the current of thought should be changed as speedily as possible by some powerful sensible impression on a distant part of the body, otherwise fatal asphyxia may speedily ensue. This, and suspended action of the heart through fear, during the inhalation of anæsthetic agents, are points requiring great attention, and the most cautious use of these agents with patients who seem in great terror when submitting to the influence. I have no doubt that this has been the real cause of several of the deaths recorded as due to an over-dose of chloroform; and using the vapour too strong at first is a most likely exciting cause of spasm of the glottis in irritable subjects, and ought, therefore, to be carefully guarded against, more especially if the patient is also labouring under a dread of the agent, or of some operation he has to undergo during its influence.—3, *St Peter's Square, Manchester, Aug.* 7.

P. S.—I shall shortly transmit you a detailed report of a case which I lately had, in which the value of chloroform was most conspicuous. It was that of an immense fatty tumour which completely surrounded the ankle-joint of a boy, covering the greater part of the dorsum of the foot, and extending seven inches upwards on the front of the leg. The boy was nine years of age, and amputation of the leg had been recommended as the only hope of ridding him of the encumbrance, which had resisted every other mode of treatment. I undertook to extirpate this tumour under the influence of chloroform, and succeeded in the most satisfactory manner; but had it not been for the aid of chloroform, it is impossible that a boy of nine years of age could have stood the pain and terror resulting from an operation involving such extensive and severe dissection of important parts, as the ankle-joint had to be laid open in order to remove the whole of the tumour. He, however, suffered neither pain nor terror from the operation, recovered beautifully, and is now in high health, the wound all but entirely closed, the patient able to walk, and free from all deformity.

MEDICAL STATISTICS AND MISCELLANEOUS.

Instances of the mode in which Emigration was conducted in 1847. (From Mr J. C. BYRNE's Twelve Years' Wandering in British Colonies, from 1835 to 1847. London, 1847).—The paper of Dr Stratton directs attention to the improper and injurious manner in which emigrants were crowded on board emigrant vessels during the fatal year of 1847. The following instances, given by Mr Byrne in his last chapter, are probably the most perfect examples of barbarity yet made known, and they are said not to be solitary.

"In the May of 1847, the author had occasion to proceed on business to Cork, and there met with the captain of a ship whom he had known well abroad. This person had been to sea for many years as a commander, and the ship of which he was captain was then lying at Cove, taking in emigrants. She was an old Liverpool vessel of about six hundred tons' measurement, and for the last two or three years had been employed in the Quebec timber trade, being too leaky for any other. She had been chartered by the agent of a large landholder in the south of Ireland, to take out a number of the tenantry, of whom he was anxious to get rid. She was to have five hundred pounds for the trip out, the landlord putting on board the necessary provisions, and sending out a person in her to distribute them. This sum included the expense of laying a temporary false deck, and fitting up berths; the ship having no deck but her upper one. For this amount, there was put on board the utmost number of emigrants the law allows, which, including children, amounted to about five hundred souls, and with this human freight she sailed for her destination—Quebec, without even the services of a surgeon being provided for the unfortunate wretches. The result may be readily foreseen. Before she had been out a week from her port of departure, in the close, crowded, and poisonous atmosphere of the dark hold, fever was engendered and disseminated, and for the five remaining weeks, till she entered the St Lawrence and landed her sick at Gros Island, not a day passed that many were not consigned to a watery grave. All the exertions of captain and crew were unavailing to stay the pestilence; the closeness of the berths, the open planking of the temporary deck—between the wide joints of which, all kinds of matter collected—bade defiance to their efforts, to which some even fell victims, and death did its fatal work rapidly. Either at sea, or after they had been landed at the Quarantine Station, rather more than one-third of the passengers died, and the greater part of the remainder were so enfeebled by long sickness and impure air, as to leave small hopes of their surviving the severe winter of Canada; more especially as few had the means of providing themselves during that time with even the necessaries of life."

"If another and yet more appalling example of the present mode in which emigration is conducted were required, it is to be found in the case of the Avon, which was brought into Miramichi in a disabled state—indeed, little better than a wreck. This unfortunate vessel was not only badly ventilated, but it was without a surgeon. From the first she had met with bad weather, which aggravated all her disadvantages, and so injured the ship, as to cause her to proceed but slowly towards her destination. Fever broke out and spread with fearful rapidity; to follow or trace it in its course would be needless; first the passengers and then the crew died away, till there were not enough left to aid the sick and bury the dead. And then, from a passenger emigrant vessel, she became a demon ship; the frenzy of worse than maniacs descended on her unhappy people; and the living refused to part with the dead, and either clasped the putrefying corpses in their arms, or sewing them up in beds and inclosing them in boxes, insisted on retaining them. The food of the living was no longer cooked, but devoured raw, and the captain and crew were refused admission to the hold. And then such a scene ensued as the most fearful pictures of God's vengeance, exemplified in the plague in days long gone by, could scarcely parallel. Driven to desperation, the captain and those that remained of his crew, by force of arms, fought their way to the hold and dispossessed the living of the dead. * * Yet, still did the angel of death hover around the devoted ship. The emigrants still continued to die, and one by one the sailors passed away, till none were left to work the ship. The captain, one of his officers, and two or three others attached to the vessel, alone remained to do duty; even these were fast sinking. * * At length the fated ship reached the shores of America, and with some difficulty obtained the aid of a steamer which towed her into her destined port; but more than one-half her human freight had perished, and many, very many more would shortly follow their comrades."

The facts here communicated form good and pointed illustrations of the bad effects of the system of emigration as noticed in the paper of Dr Stratton.

Account of a Journey in the wildest part of the Puna region of the Peruvian Cordillera. By Dr VON TSCHUDI.

Dr Tschudi gives probably a more correct account of the relative position of the different mountain chains which form the Andes than any that has yet appeared in a popular work. According to this account, Peru is intersected in the direction from S. S. W. to N. N. E. by two great mountain chains running parallel to each other. The chain nearest the coast of the Pacific is at the average distance of from sixty to seventy English miles from the sea. The other chain, more inland, pursues a parallel direction, but describes throughout its whole course a slight curve eastward. These two ranges of mountains are called the Cordilleras or the Andes, both terms being used indiscriminately. Even the Creoles of Peru confound these two terms, sometimes calling the western or seaward chain by one name, and sometimes by the other. A strict distinction, nevertheless, ought, according to M. Tschudi, to be observed. The western chain should properly, according to him, be called the Cordillera, and the eastern chain the Andes. The latter name is derived from the Quichua word *Antasuyu; Anta* signifying metal generally, but especially copper; and *suyu* a district; the meaning of Antasuyu, therefore, being the metal district. In common language, the word suyu was dropped, and the termination *a* in *Anta* was converted into *is*. Hence the word Antis, which is employed by all old writers and geographers, and is at present in common use among the Indian population of southern Peru. The Spaniards, according to their practice of corrupting the words of the Quichua language, have transformed Antis into Andes, and they apply the name without distinction to the western and eastern chain of mountains.*

The old inhabitants of Peru dwelt chiefly along the base of the eastern mountain chain, where they drew from the mines the metal which afforded material for their workmanship. Those mountains consequently retained the name of Antis or Andes. In the time of the Incas both chains were called Ritisuyu (snow districts.) The Spaniards, in invading the country, advancing from the sea-coast, first arrived at the western mountains, and them they gave the name of *Cordillera*, the term commonly employed in the Spanish language to designate any mountain chain. Most of the earlier travellers and topographers named the western chain *Cordillera de los Andes*, and regarded it as the principal chain, of which they considered the eastern mountains to be merely a branch. To the eastern range they gave the name of *Cordillera Oriental*. These denominations Dr Tschudi observes as the correct ones; calling the western chain the Cordillera, or the coast mountains; and the eastern chain the Andes, or the inner Cordillera.

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* Some derive the word Andes from the people called Antis, who dwelt at the foot of these chains of mountains. A province in the department of Cuzco, which was probably the chief settlement of that nation, still bears the name of Antas.

These two great mountain chains stand in respect to height in an inverse relation to one another. The greater the elevation of the Cordillera, the more considerable is the depression of the Andes. In South Peru, the ridge of the Cordillera is considerably lower than that portion of the Andes. In South Peru, the ridge of the Cordillera is considerably lower than that portion of the Andes which stretches through Bolivia. The medium height of the Cordillera in South Peru is 15,000 feet above the sea; but here and there particular points rise to a much more considerable elevation. The medium height of the Andes is 17,000 feet above the sea. In Central Peru the Cordillera is higher than the Andes. There the altitude of the latter along the body of the chain is 13,000 feet above the sea. On the ridge are a few points some hundred feet higher. Between Pasco and Loxas the average height of the Cordillera is between 11,000 and 12,000 feet above the sea; and the average elevation of the Andes at the corresponding point is about 2000 feet lower.

The passes run not through the valleys, but always over the ridges of the mountains. The highest mountain passes are the Renemuda (16,452 feet above the sea); the Piedra Parada (16,008 feet); the Tingo (15,609 feet); the Huatillas (14,850 feet); the Portachuelo de la Viuda (14,544 feet); the Altos de Toledo (15,530 feet); and the Altos de los Huesos (14,300 feet). In both chains are innumerable small lakes, most of them the sources of small rivers.

The Cordillera, or coast chain, presents an aspect totally different from that of the Andes. It is wilder and more rugged; its ridge is broader, and its summit less pyramidal. The summits of the Andes terminate in slender sharp points, like needles. The Cordillera descends in terraces to the level heights, while the slope of the Andes is uniform and unbroken.

It is a curious fact that all the waters of the eastern declivity of the Cordillera,—all those which have their source on the level heights and on the western declivity of the Andes,—flow thence in the direction of the east, and work their way through the eastern mountain chain. Throughout the whole extent of South America, not a single instance occurs of the Cordillera being intersected by a river,—a fact the more remarkable, because in Southern Peru and Bolivia the coast chain is lower than the Andes.

Between the Cordillera and the Andes, at the height of 12,000 feet above the sea, are vast tracts of uninhabitated table-lands. These are called in the Quichua language, the Puna; and the Spaniards give them the name of *Despoblado*, the uninhabited. These table-lands form the upper mountain regions of the South American Highlands, spreading over the whole extent of Peru, from north-west to south-east, a distance of 350 miles Spanish, continuing through Bolivia, and gradually running eastward into the Argentine republic. These table-lands present a curious contrast to the Llanos, or plains of South America, situate on the other side of the Andes to the north-east. Those boundless deserts, full of organic life, are like the Puna, among the most interesting characteristics of the New World.

The climate of those regions is not less rigorous than that of the high mountain ridges. Cold winds from the west and south-west blow nearly all the year round from the ice-tipped Cordillera; and for the space of four months these winds are daily accompanied by thunder, lightning, and snow-storms. The average state of the thermometer during the cold season which is called the summer, because then it seldom snows, is, during the night,—5° R, and at mid-day, + 9° 7′ R. Within the space of a few hours, the heat varies between 18° and 20° R. A remarkable effect of the Puna wind is its power of drying animal bodies, and thereby preventing decomposition. A dead mule is in the course of a few days shrivelled into a mummy; not even the entrails presenting the smallest trace of decomposition.

It frequently happens that, after being long exposed to these cold winds, the traveller enters warm atmospheric currents. These warm streams are sometimes only two or three paces, and at other times several hundred feet broad. They run in a direction parallel with each other; and the traveller may pass through five or six of them in the course of a few hours. They are most common during August and September, and they follow the general direction of the Cordillera from S. S. W. to N. N. E.

Of a journey in this elevated and desolate region, ending in an attack of *Surumpe*, Dr Tschudi gives the following account:—

On the 12th of January 1840, having passed the night in the hut of a Puna shepherd, I awoke next day at day-break. The sun was just beginning to cast a light red tinge on the snow-capped tops of the Cordillera. Through the aperture in the roof of the hut, which served the purpose of a chimney, penetrated a feeble light, sufficient to show the misery and poverty that prevailed in the interior of the habitation. I arose from the resting place, on which, only a few hours previously, I had stretched myself exhausted by cold and fatigue, and raising the cow-hide, which closed the door-way of the hut, I went out to make preparations for the continuance of my journey.

I saddled my mule, and put into one of the saddle-bags a small supply of food. While I was thus engaged, one of those fierce little dogs, which are domiciled in every Indian hut, slyly watched my movements; and though he had rested at the foot of my bed during the night, yet he was only prevented by the repeated threats of his master from making an attack upon me. My Indian host handed me my gun; I paid for my night's lodging by a few reals and some paper cigars; and, having wished him to direct me on my way, I rode off, while he was expressing his gratitude and his kind wishes in the words *Dios lo pague.*

The sky was overcast by a thick mist, and the snow, which had fallen during the night, covered the ground as far as the eye could reach. On my way, I met an old Indian woman driving her sheep. The bleating flock moved slowly on, leaving a deep furrow in the snow, and seeming impatient till the sun should dispel the mist, and dissolve the white covering which overspread their scanty pasture. A little farther on, I met the son of this Indian shepherdess. He and his dog were busily engaged in catching partridges, destined to be sold on the following Sunday in the nearest village.

My road lay along a gentle acclivity interspersed with roads and swamps, which often obliged me to make wide circuits. The swamps, or as the Indians call them, Atolladerro, are dangerous to travellers in the Puna, who, with their horses and mules, sometimes sink into them and Perish. Even in the most open parts of the country, it is not easy to discern the swamps; and the ground often sinks beneath the rider where he least expects it. At length the mist began to be dispersed, and the snow gradually melted beneath the rays of the sun. I was now on one of the level heights, about 14,000 feet above the sea. On both sides arose the high Cordillera summits, crowned with eternal ice; detached peaks here and there towering to the skies. Behind me lay the dark deep valleys of the lower mountain regions, which, with the scarcely discernible Indian villages, receded in the distance till they were blended with the line of the horizon. Before me stretched the immeasurable extent of the level heights, at intervals broken by ridges of hills.

How little life had the sun yet awakened around me! The dull yellow Puna grass, scarcely the height of the finger, blended its tint with the greenish hue of the glaciers. Advancing in my course, how joyfully I greeted the purple gentian and the brown *calceolaria!* With what pleasure I counted the yellow blossoms of the *echino cactus*, while the sight of the *ananas cactus* pictured in my mind all the luxuriance of the primeval forests. These *Cacti* were growing amidst rushes and mosses and syngenesiæ, to which the frost had given a rusty brown hue. Not a butterfly fluttered in the rarified atmosphere; no fly or winged insect of any kind was discernible. A beetle or a toad creeping from their holes, or a lizard warming himself in the sun, are the only indications of animal life to the naturalist.

As I journeyed onward, animate life awakened in rich variety around me. Birds, few in species, but numerous in individuals, everywhere met my view. Herds of vicunas approached with curious gaze, and then suddenly fled with the swiftness of the wind. In the distance, I observed stately groups of Huanacas turning cautiously to look at the traveller, and then passing on. The Puna stag (*tarush*) slowly advanced from his lair in the mountain recesses, and fixed on me his large wondering eyes; while the nimble rock rabbits (*vischacas*) disported and nibbled the scanty herbage growing in the mountain crevices.

I had wandered for some hours, admiring the varieties of life in this peculiar alpine region, when I stumbled against a dead mule. The poor animal had probably sunk beneath his burden, and had been left by his driver to perish of cold and hunger. My presence startled three voracious condors which were feeding on the carcase. These monstrous birds shook their heads, and darted at me furious glances with their blood-red eyes. Two rose on giant wings, and hovered threateningly above my head, while the third, croaking fiercely, kept guard over the body. These condors were the only hostile animals I encountered in this part of the Puna.

It was now two o'clock in the afternoon, and I had ridden in a continuous though gradual ascent since sunrise. My panting mule slackened his pace, and seemed unwilling to climb a rather steep ascent at which we had arrived. To relieve him I dismounted, and began walking at a rapid pace. But I soon felt the influence of the rarified atmosphere, and I experienced an oppressive sensation which I had never known before. I stood still for a few moments to recover myself, and then tried to advance; but an indescribable oppression overcame me. My heart throbbed audibly; my breathing was short and interrupted; a world's weight seemed to lie upon my chest; my lips swelled and burst; the capillary vessels of my eye-lids gave way, and blood flowed from them. In a few minutes my senses began to leave me. I could neither see, hear, nor feel distinctly. A gray mist floated before my eyes; and I felt myself involved in that struggle between life and death which a short time before I fancied I could discern on the face of nature. Had all the riches of the earth and the glories of heaven awaited me a hundred feet higher, I could not have stretched out my hand toward them.

In this half-senseless state I lay stretched on the ground until I felt sufficiently recovered to remount my mule. One of the Puna storms was gathering; thunder and lightning accompanied a heavy fall of snow, which very soon lay a foot deep on the ground. In a short time I discovered that I had missed my way. Had I then known the Puna as well as I afterwards did, I should have shaped my course by the flight of birds. But unluckily, I pursued the fresh track of a herd of vicunas, which led me directly into a swamp. My mule sunk, and was unable to extricate himself. I was almost in despair. Nevertheless I cautiously alighted, and, with incredible difficulty, I succeeded in digging out with a dagger the mud in which the animal's legs were firmly fixed, and at length I got him back to a solid footing. After wandering about in various directions, I at length recovered the right path, which was marked by numerous skeletons protruding above the snow. These were the remains of beasts of burden which had perished on their journeys,—a welcome though ominous guide to the traveller. The clouds now suddenly separated, and the blazing light of the tropical sun glared dazzlingly on the white plains of snow. In one moment I felt my eyes stricken with *surumpe.*

Suffering the most violent pain, and tormented by the apprehension of blindness, I with great difficulty pursued my way. My mule could scarcely wade through the sward, which was becoming more and more thick, and night was advancing. I had lost all feeling in my feet; my benumbed fingers could scarcely hold the bridle, and I well knew that the nearest point at which I could obtain the shelter of a human habitation was eight German miles distant. I was beginning to give myself up for lost, when I observed a cave beneath an overhanging rock. I entered, and found that it protected me securely against the wind and the snow. Having unsaddled my mule, I made a couch of my saddle-clothes and pouch. I tied the animal to a stone, and, while he regaled himself with the scanty grass that was not buried beneath the snow, I satisfied my hunger with some roasted maize and cheese.

Exhausted by the fatigue of the day, I lay down to sleep, but no sooner had I fallen into a slumber than I was awakened by a violent smarting in my eyes, occasioned by the *surumpe.* There was no longer any hope of sleep. The night seemed endless. When the dawn appeared, I made an effort to open my eyes, which were closed with coagulated blood. On looking around, I beheld all the horror of my situation. A human corpse had served for my pillow. Shuddering, I hastened from this dismal spot in search of my mule. The poor beast lay dead on the ground. In his ravenous hunger he had eaten of the poisonous *garbanallo.* In despair I turned back to the cave.

The sun had now fully risen, and his rays diffused warmth over this frozen region. Somewhat roused by the reviving light and life around me, I began to examine the body of the lifeless man. He might be one of our own race; a traveller who had perished of cold and hunger. No. He was a half-caste Indian, and many deadly wounds on his head showed that he had died by the slings of Indian robbers, who had stripped him of his clothes and concealed the body in the cave.

With my gun I shot a rock-rabbit, and, collecting some fuel, I kindled a fire and roasted the little animal, which furnished a breakfast not very savoury. I then waited patiently in the hope that some timely help would deliver me from my dreary situation.

About noon, I heard a short monotonous cry. I climbed the nearest rock, and in a hollow perceived two Indians, whom I had seen the day before, driving their llamas to the nearest mine works. By the gift of a little tobacco I prevailed on them to let me have one of their llamas to carry my luggage, and, having strewed a few handfuls of earth on the corpse of the murdered man, I departed. The scene of the incidents here described was the Cave of Lenas, in the Altos, which lead southward to the Quebradra of Huactara.—Chapter xii. end.

Note from Dr Blair on the alleged adulteration of Sulphate of Bebeerine.—Georgetown, British Guiana, 18*th February* 1848. *To the Editor of the Edinburgh Medical and Surgical Journal.*—Sir, the Journal of April last, containing my report on bebeèrine, was seen by me only about two months since.

In consequence of the statement made by Dr Maclagan in his note prefixed to the report, that the bebeerine which I had used, and which had been obtained from Messrs **** **** was very impure, from the large quantity of sulphate of lime it contained, a sample of the same article which I had used was placed in the hands of Dr Shier of the Colonial Laboratory for examination.

Dr Shier's communication on the subject I beg leave to inclose for your information,—and I remain, Sir, very respectfully yours, Daniel Blair.

Colonial Laboratory, Georgetown, 18th February 1848.—Dear Sir,—I am sorry that the researches carrying on in the laboratory are such as have caused delay in the examination of the specimen of sulphate of bebeerine you sent

It has now been submitted to a careful analysis, but no trace of sulphate of lime was found in it,—a substance with which it was said to be adulterated to a large extent.

From the appearance of the sulphate of bebeerine, its amorphous form, and the large quantity of colouring matter it contains, it is not likely, as at present prepared, to constitute a very uniform drug.

It is satisfactory, however, to find that this specimen, selected at random from nearly 200 ounces ordered for the Colonial Hospital, is entirely free from the large per centage of sulphate of lime affirmed to exist in it.

With more leisure, the examination of this alkaloid will form a most interesting, and, I trust, useful research.—I am, yours truly, David Shier, M. D.—Daniel Blair, Esq., M. D., Surgeon-General of British Guiana.

Dr Maclagan requests us to state that his supposition that the impure bebeerine had been used by Dr Blair, arose from his having examined a sample from the same manufactory, remarkable for its pale colour, and which contained the large amount of sulphate of lime. Since that time, however, the same firm has uniformly prepared the sulphate of fine quality, and quite exempt from this impurity; and it is obvious, from Dr Shier's experiments, that it was this last which had been used by Dr Blair.

Other practitioners, in tropical climates, have communicated to Dr M. results of an unsatisfactory nature; so that, whilst bebeerine appears valuable in the periodic and atonic forms of disease in this country, its applicability to tropical intermittents and remittents is matter of doubt.

On the denominations of Weight and Measure employed by German and other foreign writers on Anatomy.—It may be here mentioned, once for all, that all German writers on anatomy, physiology, and pathology, use the old French measures of the Paris foot, inch, and line. The foot consists of twelve inches, and the inch of twelve lines. Fifteen Paris feet are supposed to be equivalent to sixteen English feet, and nine Paris lines are supposed to be equal to eight-tenths ($\frac{8}{10}=\cdot 8$) of one English inch; three fourths of one Paris inch are therefore equivalent to four-fifths of one English inch. One old Paris foot contains 325 millimetres; consequently, one Paris inch contains $27\frac{1}{12}$ millimetres. The millimetre is equivalent to .03937 parts of one English inch, as the metre is 39.371 English inches, or three feet, three inches, and three-tenths.

Some persons divide the inch into 10 lines. So much discordance causes great confusion and inconvenience; and it would be desirable that one uniform standard should be followed.

The knowledge of the following equivalents may be useful.

36 Paris feet nearly equal to	37 Vienna feet.
28	29 Prussian and Rhineland feet.
9	10 Bavarian, Hanover, and Bern.
13	15 Dresden, Leipzig, Amsterdam, and Spain.
53	60 Wurtemberg, Darmstadt, Hamburg.
8	9 Bremen.
7	8 Frankfort on the Main.
11	12 Bohemian.
15	16 Baden, England, Russia.
27	28 Denmark.
1	325 Millimetres.
4‴ lines	9 Millimetres.

9‴ lines are nearly equal to 0.8 of one English inch.
11′ feet ... ... 16 Small Roman palms.
11′ do. ... ... 80 Russian werschok.

Weights of organs are given according to the best known German medicinal or Nuremberg apothecaries' weight, in which one pound is divided into twelve (12) ounces, ninety-six (96) drachms or quentchen, 288 scruples, and 5760 grains.

Nuremberg Apothecaries' Weight.	
128 lbs. are very nearly equal to -	109 lbs. Vienna apothecaries' weight.
108	110 Prussian apothecaries' weight.
24	23 English Troy weight of 12 ounces, 96 drachms, 5760 grains.
14	11 Avoirdupois weight of 16 ounces, or 7000 grains, Troy weight.
70	51 Livres French poids du marc of 16 oz. 128 gros, 9216 grains.
178	64 Kilogrammes.
$16\frac{1}{10}$ grains	1 Gramme.

In general, the custom observed by Krause, Henle, and most writers who have occasion to use these dimensions, is to mark them by abbreviations in the following manner,—′ foot, ″ inch, ‴ line; so that 2′ 5″ 7‴ signifies 2 feet, 5 inches, and 7 lines.

Report on the Mortality of Edinburgh and Leith for the Months of June, July, and August 1848. By James Stark, M. D., Fellow of the Royal College of Physicians of Edinburgh.—The mortality of Edinburgh during the months of June, July, and August 1848, amounted to 1018,—502 being males, 450 females, and 66 still-born. The mortality in Edinburgh for the corresponding months of 1845, 46, and 47 was respectively 935, 1077, and 1634.

The mortality of Leith during June, July, and August amounted to 236,—106 being males, 118 females, and 12 still-born. The mortality in Leith during the corresponding period of the years 1845, 46, and 47 was respectively 128, 199, and 166.

The meteorological phenomena of June, July, and August differed in several important particulars from those of the corresponding months of last year. Thus the mean temperature of the months of June, July, and August 1848 was respectively 55·13, 57·88, and 54·37 degrees of Fahrenheit's scale, while the mean temperature of the corresponding months of 1847 was respectively 57·83, 61·22, and 58·22. During June of this year the range of temperature was from 37 to 75 degrees; during June of last year, from 38 to 78 degrees, being a range of 38 degrees during the month of June in each of these years. During July 1848 the range of temperature was from 38 to 82 degrees; during July 1847, from 42 to 83 degrees, being a range of 44 degrees in 1848, but of 41 degrees in 1847. During August of this year the range of temperature was from 36 to 70, but in August of last year from 37 to 77 degrees; being a range of 34 degrees in 1848, but of 40 degrees in 1847. More than twice the amount of rain fell during June, July, and August of this year than during the corresponding period of last year. Thus during the above months of 1848, the aggregate fall of rain amounted to 9·40 inches; but during the corresponding months of 1847 only to 4·07 inches. The mean barometric pressure was 29·46 inches during June of this year, 29·57 inches during July, and 29·50 inches during August, the cistern of the barometer being 246 feet above the mean level of the sea at Leith. In 1847 the mean pressure of the atmosphere during the months of June, July, and August was respectively 29·64, 29·78, and 29·68 inches. West and westerly winds blew 51½ days, east and easterly winds 31 days during the above months of this year; but during the corresponding period of last year westerly winds blew 62½ days, and easterly winds 24 days.

The peculiarities, therefore, of the atmospheric phenomena during the months of June, July, and August of this year, as compared with that of the corresponding months of last year, consisted in, (1.) a lower mean temperature; (2.) a lesser range of temperature; (3.) a much greater fall of rain, and a consequently more humid state of the atmosphere; (4.) a lower barometric pressure; (5.) and lastly, a greater prevalence of easterly winds. How far these atmospheric phenomena have exerted an influence on the prevailing epidemics (typhus and scarlet fevers), experience and observation have as yet failed satisfactorily to demonstrate. But these facts, so far as they go, taken in connection with the low mortality in Edinburgh during those months, appear to corroborate Dr Casper of Berlin's remarks, deduced from pretty extensive statistical researches, that a humid state of the atmosphere and a low barometric pressure are more favourable to life than a dry condition of the atmosphere and a high barometric pressure.

As from the above general statement of the mortality in Edinburgh and Leith it is apparent that the ratio of mortality differs in towns even closely adjoining, it may be interesting to compare the mortality of these places during the second quarter of the year with that occurring in several of the chief towns of England. The calculations of the mortality in the English towns are based on the Registrar-General's "Returns of the Mortality in 117 Districts of England for the Quarter ending June 30th, 1848." As the year 1846 may be considered as a year of mean mortality, the towns are arranged in the order of least increase during 1848 as compared with that year.

Table I.—Proportional Mortality of different Towns during the Second Quarter (ending 30th June) of the years 1846, 47, and 48.

Places.	Mortality of Second Quarter, 1846.	Mortality of Second Quarter, 1847.	Mortality of Second Quarter, 1848.	Percentage of mortality in 1848, with that of 1846.	Percentage of mortality in 1848, with that of 1847.
Liverpool, .	2,098	4,809	1,907	— 10·01	—152·17
Carlisle, .	241	433	235	— 2·55	— 84·25
Edinburgh, . .	1,062	1,529	1,107	+ 4·23	— 38·12
England and Wales,	43,734	51,585	46,552	+ 6·44	— 10·81
Manchester, .	1,611	2,362	1,746	+ 8·37	— 35·22
London, .	11,423	12,361	12,945	+ 13·32	+ 4·72
Wolverhampton,	500	847	625	+ 25·00	— 35·52
Birmingham, .	842	1,263	1,135	+ 33·61	— 11·27
Leith, . .	160	189	237	+ 48·12	+ 25·39

Note.—The + mark in the above table denotes that the mortality of 1848 was greater than that of the years 1846 or 1847 by the amount specified. The — mark denotes that it was less.

This table, while it shows that Edinburgh, as compared with the standard of 1846, only exhibited an increase of 4 per cent., and in this respect has been more favourably dealt with than England and Wales, than Manchester, London, Wolverhampton, or Birmingham, also shows that Leith, during the same period, has had its mortality increased in the ratio of 48 per cent., being a greater increase than that of any of the places mentioned in the table. Again, while the mortality in Edinburgh was 38 per cent. below the mortality of 1847, that of Leith was 25 per cent. above it. In fact, Leith and London are the only towns in the above table whose mortality during the second quarter of 1846 has been above that of the epidemic and fatal season of 1847.

One fact, however, brought out very prominently in the above table, calls for remark, that is the high position as to improved healthiness which Liverpool has attained during the second quarter of 1848. Liverpool has long been known as one of the most unhealthy of the towns of England. About two years ago, however, the authorities there got a Local Sanitary Act passed, which they have been actively working since, under the superintendence, it is understood, of James Newlands, Esq., Civil Engineer, and Dr W. H. Duncan, Medical Officer of Health; and the inhabitants of that large and populous town seem now to be reaping the first fruits of the benefits which will accrue from their praiseworthy efforts to improve the sanitary condition of their town. From Dr Duncan's last report, of date 9th August 1848, we learn that "It is satisfactory to know that Liverpool is better prepared than at any former time to meet a visitation (the cholera) such as we are now threatened with. Within the last few months nearly 2000 houses, which were discovered in a filthy and unwholesome condition, have been cleansed, after notice from the officers of the committee; 5000 of the most unhealthy cellars have been cleared; considerable progress has been made in house-drainage; and a marked improvement has taken place in the condition of the back streets and courts, which are better and more regularly cleansed than before." It is to be hoped that the marked improvement in the health of that town will continue, and that the example thus shown of the unquestionable benefits which result from a Local Sanitary Act will induce the other towns of England to avail themselves of the provisions of "The Public Health Act of 1848," and induce Government, with as little delay as possible, to extend the same to Scotland, where it is even more required than in England.

In last report it was mentioned that the number of deaths in Edinburgh, which in January amounted to 19·8 daily, gradually fell, till in May they only amounted to 11·7 deaths daily, being merely a fraction above the daily average of the last seven years, excluding last year, which was one of excessive mortality. The mortality since May has still continued on the decline, the daily average being 11·7 deaths during June, 9·3 during July, and 10 during August.

The mortality of Leith, on the other hand, has risen considerably above the average of former years. Thus during the months of June, July, and August of this year the mortality of Leith was 91·4 per cent. above that of the corresponding months of 1845; 23·7 per cent. above that of the corresponding period of 1846; and 47·3 per cent. above the deaths during the corresponding months of 1847.

From this statement, then, it is apparent that while the mortality of Edinburgh during the above months has been below its usual standard, that of Leith has been greatly above it.

The mortality from the class of zymotic (*i. e.* epidemic and contagious) diseases, as compared with the total mortality, has been above the average proportion during the above three months. Thus in Edinburgh, during 1846, the deaths from the zymotic class of diseases was to the total mortality as 24 to 100; but during the above three months of this year, the deaths from this class of diseases in Edinburgh were in the proportion of 32 to the 100 deaths from all causes; while in Leith, they were in the high proportion of 43 to the 100 deaths from all causes. In both Edinburgh and Leith, this high proportion was kept up by the last lingering remains of typhus fever, but more particularly by the great prevalence of epidemic scarlet fever. Leith, in especial, has been ravaged by scarlet fever, as is manifest from the fact that, whereas in Edinburgh the deaths from this disease were in the proportion of 9 out of every 100 deaths from all causes, in Leith they bore the high proportion of 26 out of the 100 deaths. Of the 88 fatal cases of scarlet fever in Edinburgh, 51 were males and 37 females. Of the 59 fatal cases in Leith, 29 were males and 30 females. Measles and hooping-cough have been in almost complete abeyance during the above months,—a circumstance which has frequently been remarked during the excessive prevalence of epidemic scarlet fever.

The mild and somewhat moist condition of the atmosphere which prevailed during the above months proved favourable to those affected with consumption and other diseases of the respiratory organs. Indeed, the mortality of diseases of the respiratory organs has not been so low during any month of the last two years, as during the months of July and August of this year.

The influence of weather on disease was, however, still more strikingly manifested in regard to bowel complaints and affections of the organs of digestion, registered under the heads of diarrhœa, dysentery, cholera, teething, inflammation of the bowels, &c. During the heats of summer and autumn, these diseases in general become exceedingly prevalent and fatal, and it has been the too common belief that the use of fruit and vegetables was the cause of these affections. The mortality of these diseases, however, during the above months, most satisfactorily proves that these diseases do not depend on, or are caused by, the use of fruit and vegetables as articles of diet, but that atmospheric agencies, and, in especial, temperature, exert a most marked influence on their prevalence and fatality. Thus during the month of August 1846, when the mean temperature was so high as 59·58 degrees Fahrenheit, the deaths from bowel complaints and diseases of the organs of digestion amounted to 81 in number. During August 1847, when the mean temperature was a full degree lower, viz. 58·22, the deaths from the same class of diseases fell to 71 in number. But during August of this year, when the mean temperature was so low as 54·37 degrees, the deaths from these diseases only amounted to 33.

The mortality of diseases of the brain has been much less during the above-named months of this year than during the corresponding period of 1846 or 1847. Thus during June, July, and August 1846, the deaths from these diseases amounted to 116; during 1847 to 120; but during the corresponding months of this year only to 79. Whether the milder weather during the present year has occasioned this result is difficult to prove; but, as was pointed out in last Report, the proportional mortality of diseases of the brain is unquestionably much greater in warm than in cold weather; and it is exceedingly probable that the greater mildness (or coldness) of the summer of this year has been the chief agent in lessening the mortality arising from this class of diseases.

The same diminished mortality was noted with regard to diseases of the heart and blood-vessels during the above months of this year. Thus, during June, July, and August 1846, the deaths from this class of diseases amounted to 29; during 1847, to 26; but during this year to 21 only.

The influence of weather on health was also very strikingly illustrated in the proportional mortality among persons above 60 years of age during the corresponding months of 1846–7 and 1848. Aged persons are extremely sensitive to atmospheric agencies, particularly to sudden changes of temperature, and to extremes of heat and of cold. When the weather is mild, and the air not too dry, the mortality among the aged is at a minimum; but, as the temperature rises above or falls below that mean, the mortality among them increases. This was very well illustrated by the proportion of deaths among the aged to the total deaths in Edinburgh during the months of June, July, and August, of the years 1846, 1847, and 1848. This year, while the mean temperature of these months was 55·79 degrees Fahrenheit, the barometric pressure low, and the atmosphere moderately humid, the deaths above 60 years of age were to the total deaths in the low proportion of 13 to 100. During 1847, when the mean temperature of these months was 59·09 degrees, the barometric pressure above the average, and the air very dry, the deaths above 60 rose to the proportion of 15 out of every 100 deaths at all ages. And during 1846, when the mean temperature was still higher, viz. 60·76 degrees, the barometric pressure above the average, and the fall of rain excessive, the proportion of deaths among the aged rose to 18 per cent. of the total deaths. The greatest absolute number of deaths, however, among the aged occurred during the three months of 1847, when the mean temperature was high and the atmosphere very dry. In former reports the baneful effects of a low temperature on the aged have been frequently pointed out. The facts, therefore, stated in this and former reports seem to warrant the conclusion that a mean temperature such as we have had this year, with a moderately moist condition of the atmosphere, and a low barometric pressure, are the conditions of the atmospheric phenomena which are most favourable to the health of those advanced in years. But, in fact, these are the conditions most favourable to life at all ages, seeing the above facts seem to prove that though excessive heat, generally speaking, is most baneful to certain classes of disease, even these, under the same temperature, are rendered more or less fatal according as the atmosphere is more or less dry or humid. Thus extreme heat with drought seems to cause a greater mortality among those labouring under diseases of the respiratory organs, and of the brain, as well as in all persons above 60 years of age, than when an equally high temperature is accompanied with considerable atmospheric moisture. On the other hand, bowel complaints and heart diseases seem to be more under the influence of temperature alone.

These facts relative to the influence of atmospheric agencies on disease might be rendered more tangible by arranging them in a tabular form. The following table, then, exhibits the influence of weather on disease, by showing the varying number of deaths in the population of Edinburgh from certain classes of disease during the months of June, July, and August of the years 1846, 1847, and 1848.

DISEASE.	1846. Heat great; moisture excessive; high barometric pressure. Mean Temperature, 60·76 degrees. Fall of Rain, 12·77 inches. Mean Barometer, 29·68 inches.	1847. Heat great; drought great; high barometric pressure. Mean Temperature, 59·09 degrees. Fall of Rain, 4·07 inches. Mean Barometer, 29·70 inches.	1848. Heat moderate; moisture moderate; low barometric pressure. Mean Temperature, 55·79 degrees. Fall of Rain, 9·40 inches. Mean Barometer, 29·36 inches.
Respiratory organs,	219	280	180
Bowel complaints, &c.	173	177	150
Or during August,	81	71	33
Brain diseases, .	116	120	79
Heart diseases, .	29	26	21
Aged above 60, .	180	242	124
Or per centage of Aged to total mortality,	18	15	13

It may be stated that the mean temperature of Edinburgh during the last three years was 47·67 degrees Fahrenheit. The mean barometric pressure 29·55 inches; and the mean annual fall of rain for the last nine years 24 inches.

Notwithstanding the nearness of Leith to Edinburgh, the mortality there during the above months appears to have been under very different influences from what it has been in Edinburgh, having apparently been aggravated by local causes which have exercised a deleterious influence on its inhabitants. With the exception of the zymotic class of diseases, whose mortality, as above noticed, so greatly exceeded that of former years, the mortality of all the other classes of disease was very nearly the same as during the corresponding period of last year.

As repeated inquiries have been made relative to the BIRTHS occurring in Edinburgh and Leith, it may be stated once for all, that the reason why no notice has been taken of these is, that not exceeding a fourth of the actual births are entered on the parochial registers, consequently the information is quite useless for statistical purposes. Thus, if the births in Edinburgh bore to the population the same proportion as they do in London, then, by the last census of the population, 4382 births ought to be registered annually in Edinburgh; yet the number actually registered within the parliamentary bounds was only 1041 births in 1845, and 1085 in 1846, or less than a fourth of the actual births.

The following is the Abstract of the Mortality Tables of Edinburgh and Leith for the months of June, July, and August 1848.

MORTALITY OF EDINBURGH AND LEITH
For months of June, July, and August 1848.

Ages.	Edinburgh.						Leith.					
	June.		July.		August.		June.		July.		Aug.	
	M.	F.	M.	F.	M.	F.	M	F.	M	F.	M	F.
1 year and under,	35	22	32	16	30	25	3	5	2	8	9	6
2	5	17	10	9	8	8	3	6	3	3	2	3
5	14	14	11	8	30	10	7	6	5	2	6	9
10	14	9	13	10	17	18	4	7	6	4	1	3
15	3	4	3	1	1	6	2	1	0	0	1	0
20	6	16	12	4	8	5	1	0	2	4	1	0
30	22	15	19	14	12	11	5	0	2	3	3	2
40	20	15	11	12	11	19	3	1	4	0	4	3
50	21	20	10	15	13	9	2	3	2	6	5	2
60	15	20	18	14	6	16	4	2	3	2	2	2
70	6	11	8	11	16	5	1	4	0	2	4	4
80	8	11	10	9	9	10	1	2	2	6	0	4
90	0	3	4	2	1	0	0	0	0	2	1	0
100	0	0	0	0	0	0	0	0	0	0	0	0
Not stated,	2	3	4	1	4	2	0	1	0	0	0	0
Total deaths,	171	180	165	126	166	144	36	38	31	42	39	38
Still-born,	13	6	14	9	17	7	2	4	2	2	1	1
Total,	184	186	179	135	183	151	38	42	33	44	40	39
	370		314		334		80		77		79	

CLASSIFIED TABLE OF DISEASES.

Mortality of Edinburgh and Leith for June, July, and August 1848.

Class.	DISEASE.	EDINBURGH.			LEITH.		
		June	July	Aug.	June	July	Aug.
I.	Small-pox,	12	3	9	2	0	0
	Measles,	5	6	3	1	0	0
	Scarlet fever,	24	20	44	22	18	19
	Hooping-cough,	3	4	3	2	1	4
	Croup,	3	2	4	0	0	2
	Diarrhœa,	0	7	8	0	1	1
	Cholera,	2	2	4	0	0	0
	Typhus fever,	52	41	42	2	7	10
	Erysipelas,	1	1	1	2	0	1
	Other zymotic diseases,	2	4	2	1	1	1
II.	Dropsy,	14	13	8	1	1	0
	Cancer,	3	3	1	0	0	0
	Debility,	10	12	17	0	0	0
	Sudden deaths,	1	1	1	1	1	0
	Other diseases of uncertain seat,	11	7	10	0	2	0
III.	Cephalitis,	0	3	2	1	1	0
	Hydrocephalus,	11	8	10	3	4	2
	Apoplexy,	4	1	2	1	1	0
	Paralysis,	5	9	11	0	0	0
	Other diseases of brain,	7	6	5	2	1	0
IV	Pneumonia,	8	3	9	2	0	3
	Asthma,	3	2	2	0	0	3
	Consumption,	50	47	36	11	4	4
	Other diseases of respiratory organs,	9	4	7	1	1	1
V.	Diseases of heart and blood-vessels,	8	8	5	3	1	1
VI.	Teething,	12	5	4	0	3	4
	Inflammation of bowels,	23	17	7	4	5	2
	Tabes mesenterica,	11	8	11	2	1	4
	Other diseases of organs of digestion,	7	11	4	0	0	0
VII.	Kidney and urinary diseases,	3	1	3	0	0	1
VIII	Child-birth,	6	2	0	0	0	1
	Diseases of uterus, ovaries, &c.,	1	0	2	0	0	0
IX.	Diseases of bones, joints, &c.,	1	0	2	0	1	0
X.	Ulcer, carbuncle, &c.,	0	0	1	1	0	0
XI.	Old age,	19	20	24	4	10	9
XII.	Violent deaths and suicides,	11	8	6	3	5	4
	Causes not specified,	9	7	5	2	3	0
	Total deaths,	351	291	310	74	73	77
XIII	Still-born,	19	23	24	6	4	2
	Total,	370	314	334	80	77	79

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